Application Note

Loadable Firmware

How To Use Loadable Firmware

Hilscher Gesellschaft für Systemautomation mbH

www.hilscher.com

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1 Introduction

1.1 About this Document

This manual describes how to use a protocol stack as Loadable Firmware for netX 50/51/52/100/500 controllers manufactured by Hilscher. Its purpose is to help Design-in OEM developers using netX controllers on their devices to integrate the needed protocol stack into their application.

This manual provides background information about how individual software components like ROM Loader, Second Stage Bootloader and the actual firmware carrying the protocol stack are related to each other, and what tools can be used to customize and download the Second Stage Bootloader and firmware files to the netX device.

It also provides detailed step-by-step instructions for downloading the firmware components to the flash memory of a netX device. In this document, the Hilscher NXHX 50-RE Development Board serves as an example for a flash-based netX device, thus this document is also useful for users of NXHX Boards.

Note that descriptions in this document apply only to flash-based netX devices booting from flash memory. They do not apply to Hilscher devices like cifX PC Cards, which receive the Second Stage Bootloader and the firmware file on start-up via Dual-Port Memory and PCI interface from the cifX driver installed on the host PC, not from flash memory.

1.1.1 List of Revisions

Rev	Date	Chapter	Revision
1	2009-09-03	all	Created
2	2010-03-18	8	Chapter *Example HOST Interface Configuration* added
3	2011-08-09	4	Section *Modify the 2nd Stage Bootloader* instead of *Modify a Bootable Image* section.
4	2013-02-01	all 1.1.4 1.2 2 3 4 5 6 7	Structure of document revised Table revised, definitions added Section *Reference to Hardware, Drivers and Software Tools* added Chapter *Descriptions and Requirements* added Chapter *Overview of the Necessary Steps* added Chapter *Editing the Second Stage Bootloader* revised Chapter *Downloading the Second Stage Bootloader to the netX Device* revised Chapter *Downloading the Firmware to the OEM netX Device* added Chapter *Downloading the Firmware to the NXHX Board via Host Interface* revised
5	2015-01-28	all	Old tool **cifX Driver Test Application (Remote Support)** replaced with new tool **netHOST Device Test Application**.
		all	References to paths on Loadable Firmware DVD updated according to new structure of LFW DVDs.
		1.3	Section *Related Documents* updated
		9.3	Section *Contacts* updated

Table 1: List of Revisions

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1.1.2 Conventions in this Manual

Notes, instructions and results of operating steps are marked as follows:

Notes

Important: <important note you must follow to avoid malfunction>

Note: <general note>

<note where to find further information>

Instructions

1. Operational step
➢ Instruction
2. Operational step
➢ Instruction

Results

Result

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1.2 Reference to Hardware, Drivers and Software Tools

This document refers to the following netX controller types:

- netX 50
- netX 51
- netX 52
- netX 100
- netX 500

The following hardware items were used in the download instructions:

- NXHX 50-RE Board, Revision 3 (order code 7733.000)
- Hilscher NXPCA-PCI Adapter Board, Revision 5 (order code 7902.100)
- Hilscher CAB-NXPCA-PCI Cable (order code 4400.000)

This document refers to the following driver and software versions:

- USB Driver version 6.0.x.x
- Bootwizard version 1.2.x.x
- Tag List Editor version 1.1.x.x
- netHOST Device Test Application version 1.0.x.x
  (formerly *cifX Driver Test Application [Remote Support]*)
- cifX Device Driver version 1.2.x.x
- cifX Driver Setup Utility version 1.2.x.x
  (included in cifX Device Driver installation)

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1.3 Related Documents

This document refers to the following documents for further information:

Document	Path on Loadable Firmware DVD
Operating Instruction Manual *Tag List Editor*	`Documentation\4. Tool Manuals\3. Tag List Editor\Tag List Editor - Viewing and Editing Tags OI xx EN.pdf`
Function Description *Second Stage Boot Loader*	`Documentation\4. Tool Manuals\2. 2nd Stage Bootloader\Second Stage Boot Loader netX FD xx EN.pdf`
User Manual *NXPCA-PCI*	`Documentation\3. Installation Manuals\2. NXPCA-PCI\NXPCA-PCI_usermanual_en.pdf`
Operating Instruction Manual *cifX Device Driver – Installation and Operation for Windows*	`Documentation\3. Installation Manuals\1. cifX Device Driver\cifX Device Driver Installation for Windows OI xx EN.pdf`
Document	**Path on PC after Installation (standard installation path)**
Operating Instruction Manual *netX Bootwizard*	`C:\Program Files\Hilscher GmbH\Bootwizard\docs\netX Bootwizard OI xx EN.pdf`

Table 2: Related Documentation

1.4 Terms, Abbreviations and Definitions

Abbreviation	Term	Description
DPM	Dual-Port Memory	Interface between a host and the netX chip/communication controller.
LFW	Loadable Firmware	Binary code with a direct executable image for a certain protocol stack and a certain netX controller. Can be loaded to or updated in a netX device.
netX	networX on chip	Next generation of communication controllers.
OEM	Original Equipment Manufacturer	-
PCB	Printed Circuit Board	-
rcX	Real-time communication system for netX.	Real-time operating system on netX chip/communication controller.
Sec Mem	Security Memory	Memory chip provided by Hilscher storing certain device identification and license parameters. Mandatory for netX controllers used as master devices. Recommended for slave devices in Real-Time Ethernet networks (MAC address can be stored in Sec Mem).
SSBL	Second Stage Bootloader	Software module needed for booting netX controllers. Loads firmware to RAM.

Table 3: Terms, Abbreviations and Definitions

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1.5 Legal Notes

1.5.1 Copyright

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The delivered product (including the technical data) is subject to export or import laws as well as the associated regulations of different counters, in particular those of Germany and the USA. The software may not be exported to countries where this is prohibited by the United States Export Administration Act and its additional provisions. You are obligated to comply with the regulations at your personal responsibility. We wish to inform you that you may require permission from state authorities to export, re-export or import the product.

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2 Descriptions and Requirements

2.1 Description of the Components

2.1.1 What is Loadable Firmware?

The **Loadable Firmware** (LFW) for netX is a binary code with an executable image for a certain protocol stack running on a certain Hilscher netX controller. A LFW file can be recognized by its **.nxf** extension.
LFW can be copied or “downloaded” to the Flash memory connected to the netX device. Thus, OEM developers using netX controllers on their hardware can download the appropriate netX firmware after having implemented the netX on their host device. With LFW, you can not only update old versions of firmware in the netX any time later, but also load a different firmware to your netX, e. g. if you want to change to another network protocol or if you want to switch your device from slave to master or vice versa (if supported by the layout of the OEM hardware).

Dual-Port Memory and Firmware

In a dual processor system, the interface between a host CPU (e.g. PC or microcontroller) and the netX chip is the netX **dual-port memory** (DPM). The DPM is a shared memory area, which is accessible from the netX side and the host side. It is used for communication between the netX and the host CPU and for exchanging process and diagnostic data between both systems.
The netX firmware determines the DPM layout in size and content according to the communication protocol running on the netX chip.

2.1.2 Editing Firmware

Each firmware file contains a communication protocol stack with a fixed predetermined functional range, which can not be changed by the user. However, OEMs can use the **Tag List Editor** provided by Hilscher to configure certain parameters stored in the **Tag List**, which is also contained in each LFW file, in order to make the firmware operable with their customized hardware setup, and in order to let the OEMs use their own device identification on the network bus.
All netX controllers used as master devices must be equipped with a **Security Memory** (Sec Mem), in which the customized OEM identification parameters of the device are stored. Before any LFW can be loaded to the device, the device identification parameters stored in the Security Memory are checked against the corresponding parameters stored in the header of each standard LFW file. If validation fails, the firmware will not be loaded. On delivery, the header of the standard LFW file does not yet contain the appropriate customized device identification parameters, therefore the OEM has to adapt these parameters in the LFW header before he can download the file to his netX device. This can also be done by using the **Tag List Editor** provided by Hilscher.

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2.1.3 Downloading (Installing) Firmware

Downloading firmware to OEM netX device

As OEM, you can either implement a customary download function for firmware files in your own host application, or you can use the Hilscher **netHOST Device Test Application** to download the firmware file to the serial Flash of the netX device from a Windows PC via serial interface (USB or COM port).

Note that a software module called **Second Stage Bootloader** must be installed and running on the netX device before you can download a LFW file to the netX device (see section *Editing and Downloading (Installing) Second Stage Bootloader* on page 12).

The figure below shows the components needed for editing and downloading a LFW file to the serial Flash of an OEM netX device via serial interface:

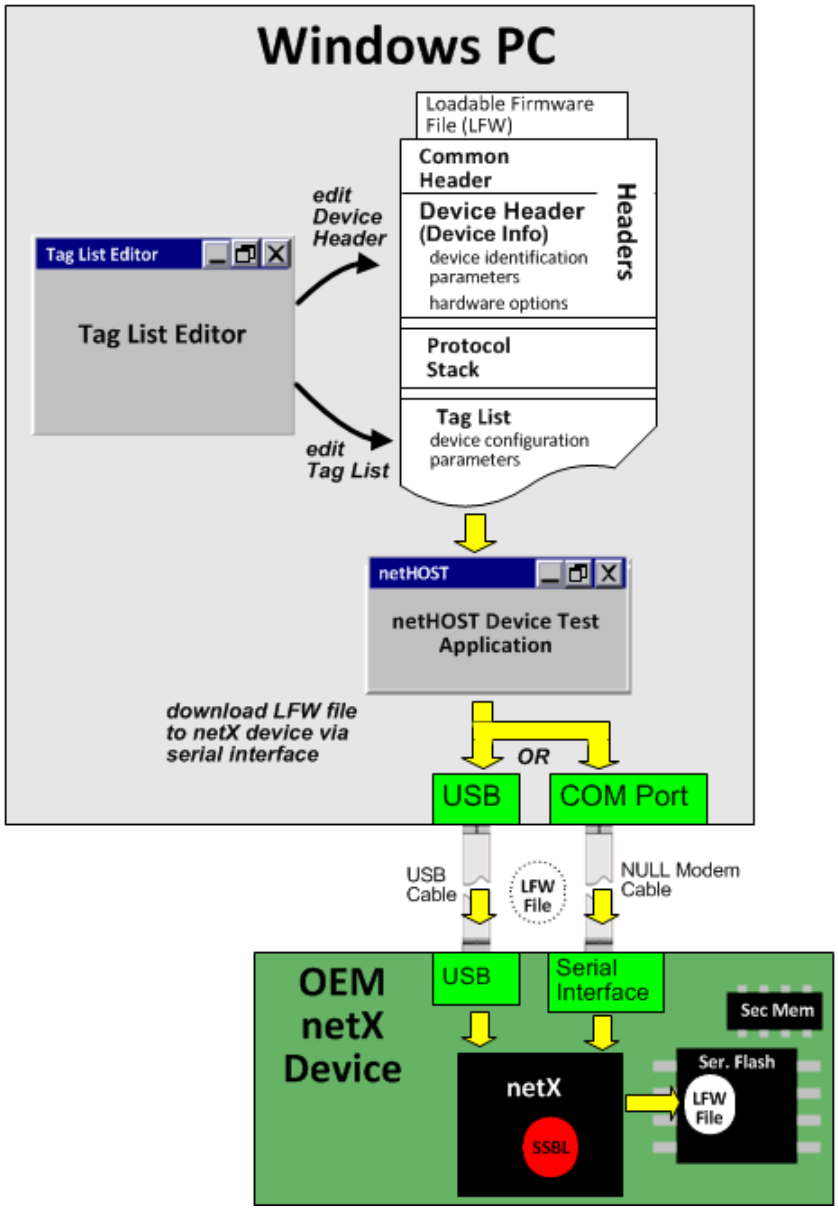

Figure 1: Edit and Download LFW to OEM netX Device

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Downloading firmware to NXHX Board (Hilscher netX Development Board)

If you are using a Hilscher NXHX Board for evaluation and development purposes as a netX device, you can either use the serial interface to download the firmware file from a Windows PC to the serial Flash of the NXHX Board (same way as described for the OEM netX device in the previous section), or you can download the file via its host interface/DPM by using the Hilscher **cifX Driver Setup Utility** and the Hilscher **NXPCA-PCI Adapter Board**.

Note that before you can download a LFW file to the NXHX Board via its host interface/DPM, the **Second Stage Bootloader** (SSBL) must be installed and running on the NXHX Board. The SSBL file can be downloaded by serial interface (see section *Editing and Downloading (Installing) Second Stage Bootloader* on page 12).

The figure below shows the components needed for editing and downloading a LFW file to a NXHX 50-xxx Board via host interface:

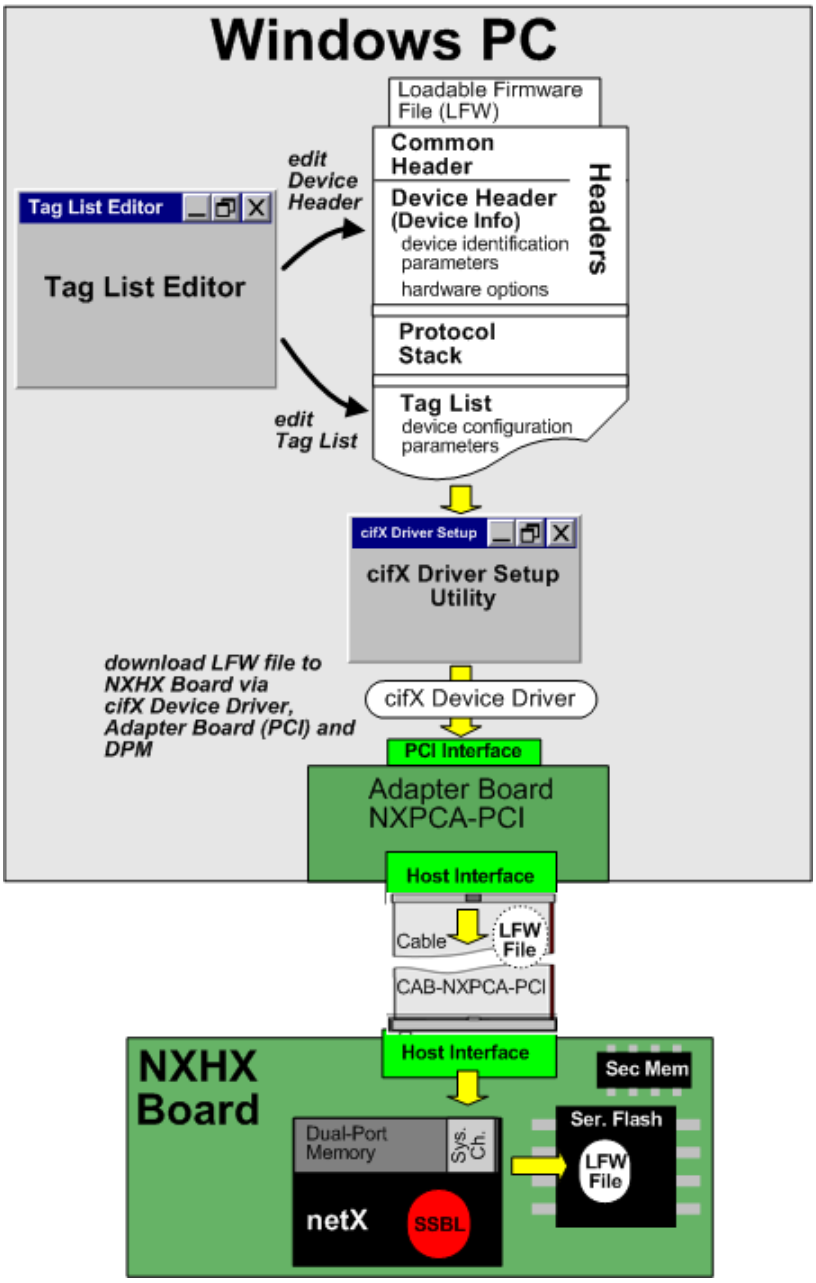

Figure 2: Edit and Download LFW to NXHX 50 Board

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2.1.4 Editing and Downloading (Installing) Second Stage Bootloader

If Hilscher Standard Loadable Firmware is used on a netX device, a software module called **Second Stage Bootloader** (SSBL), also known as Boot Strap Loader (BSL), is necessary to get the basic hardware functions running, to set up the dual-port memory and to start up the firmware. Thus, before downloading the LFW file to the netX device, the Second Stage Bootloader must be installed and running on the netX.

The SSBL file contains device configuration and identification parameters in a tag list, which can be edited with the **Tag List Editor**. If no security memory storing the device identification parameters is present on the netX device (i. e. on slave devices), the device identification parameters (which usually would have been stored in the Sec Mem) must be patched into the HW Data tag of the SSBL file, so that they can later be used to validate the identification parameters stored in the firmware file to be loaded. (Note that the HW Data tag must also be enabled before it can be used for validation.) The SSBL file also contains a device header, which usually does not need to be edited.

Like the firmware file, the SSBL file must be downloaded to the serial Flash of the netX device by the OEM developer. The file can be downloaded from a Windows PC by using the **netX Bootwizard** and a serial interface (USB or COM Port).

The figure below shows the components needed for editing and downloading a Second Stage Bootloader file:

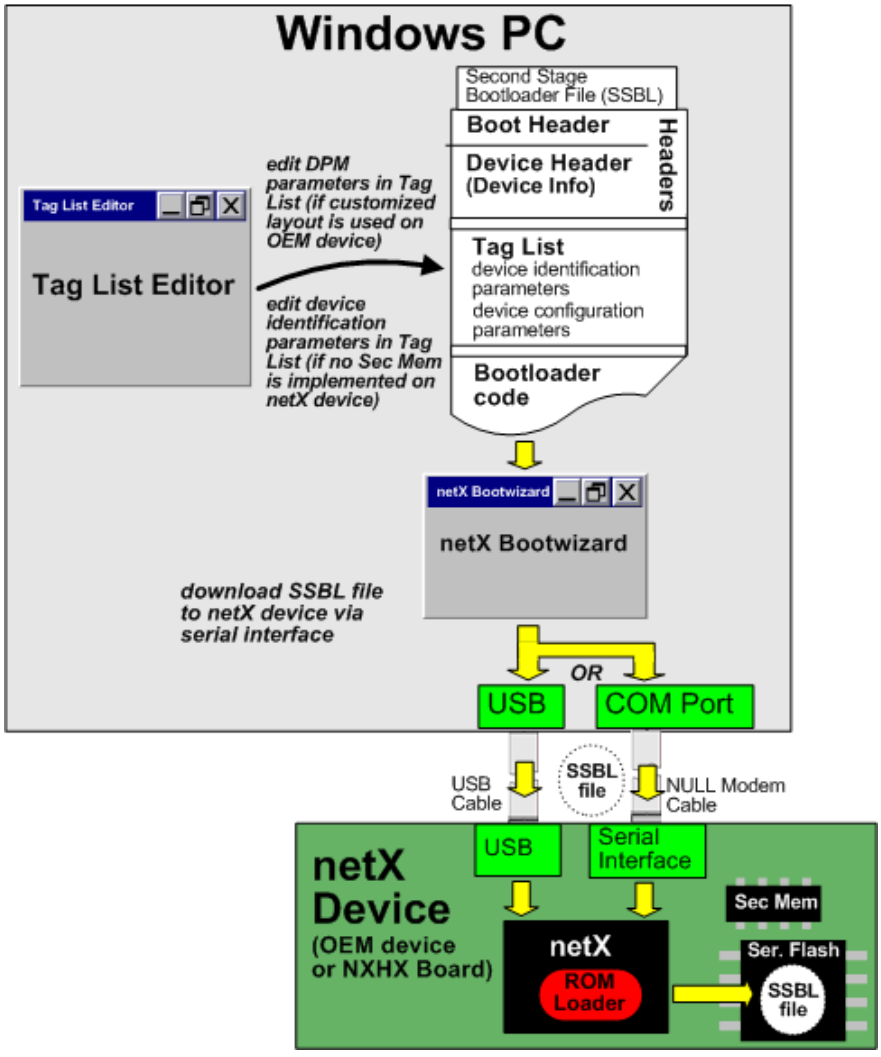

Figure 3: Edit and Download SSBL File

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2.1.5 Boot Procedure in Flash-Based netX Devices

ROM Loader and Second Stage Bootloader

After power-on reset at the netX device, the **ROM Loader** (which is a hardware function and always present in the netX) is started. The ROM loader initializes the netX controller and its optional non-volatile boot devices such as serial or parallel Flash etc. It also executes the **Second Stage Bootloader**, which is stored in the serial Flash memory of the netX device, by copying it into the internal RAM of the netX.

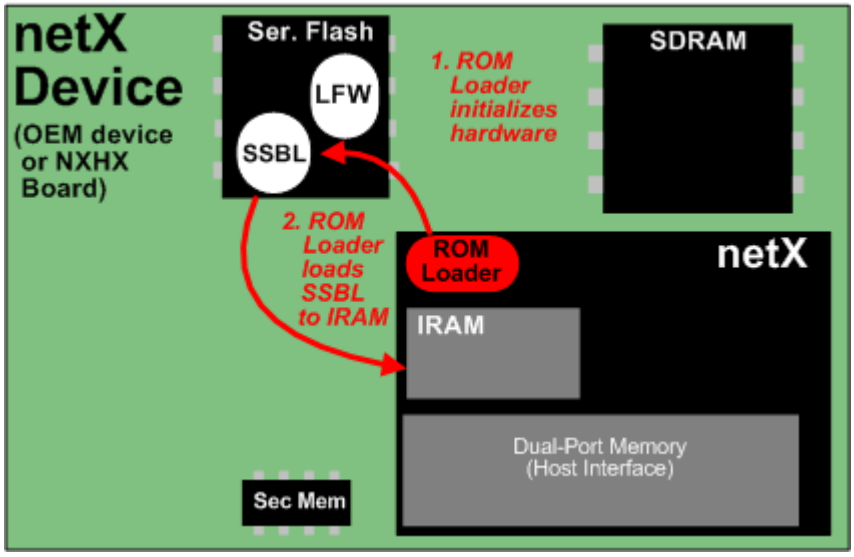

Figure 4: ROM Loader After Power-On Reset

Second Stage Bootloader

The Second Stage Bootloader is necessary to get a netX based hardware basically running and to set up a file system in the flash memory. In case no firmware is available in the serial flash memory, it also sets up the dual-port memory and creates a so-called "system device" or "system channel" in the DPM by which the firmware can be downloaded from a host.
The Second Stage Bootloader also checks and reads the **security memory** on the netX device.

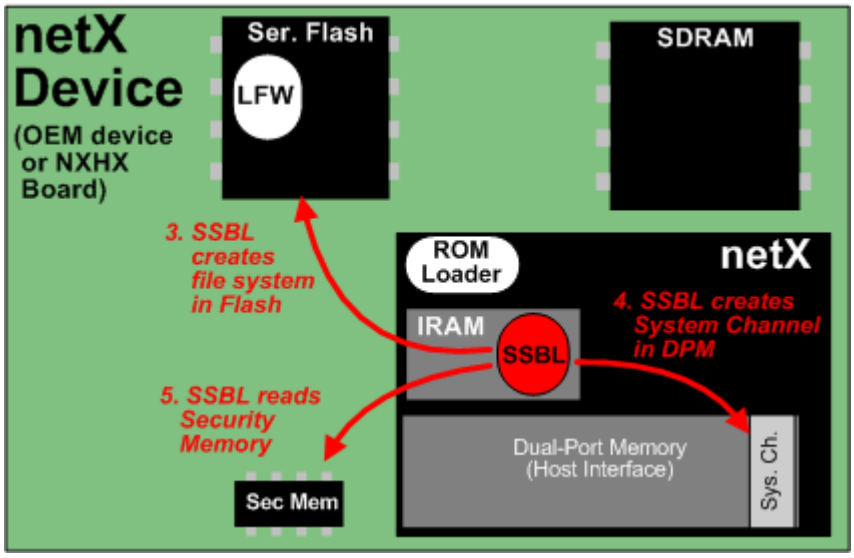

Figure 5: SSBL After Power-On Reset

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Note: The implementation of a security memory is mandatory for master devices. For slave devices in a Real-Time Ethernet network, the implementation of a security memory is recommended, because it can be used to store the MAC address of the device.

Second Stage Bootloader and Firmware

If a Sec Mem is present, the SSBL compares the device identification parameters stored in the Sec Mem with the parameters contained in the header of the firmware file. If no Sec Mem can be found, the SSBL compares the identification parameters contained in its own tag list (if enabled) with the parameters contained in the firmware header.

After successful validation, the SSBL loads the firmware from the Flash memory into the SDRAM.

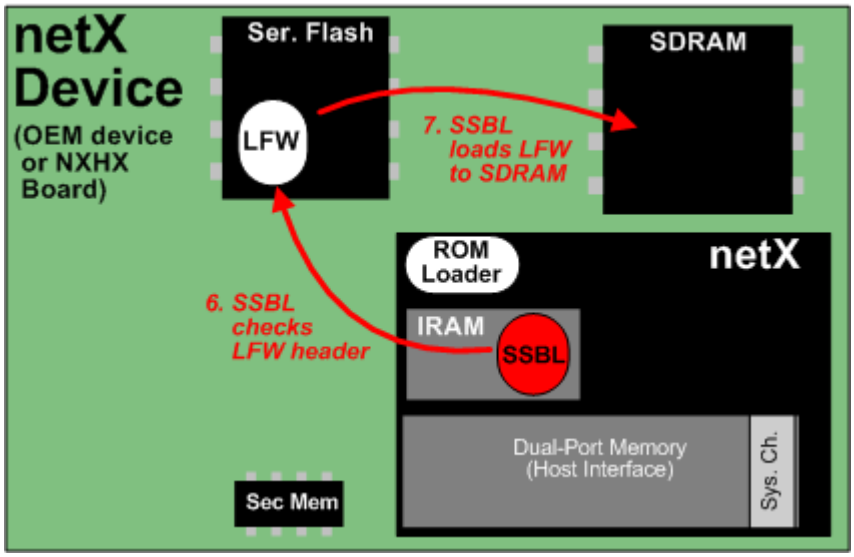

Figure 6: SSBL Loads Firmware

Firmware and Dual-Port Memory

After loading the firmware into the SDRAM, the SSBL starts the firmware. The firmware then proceeds to organize the layout of the DPM by creating the necessary communication channels according to the protocol stack.

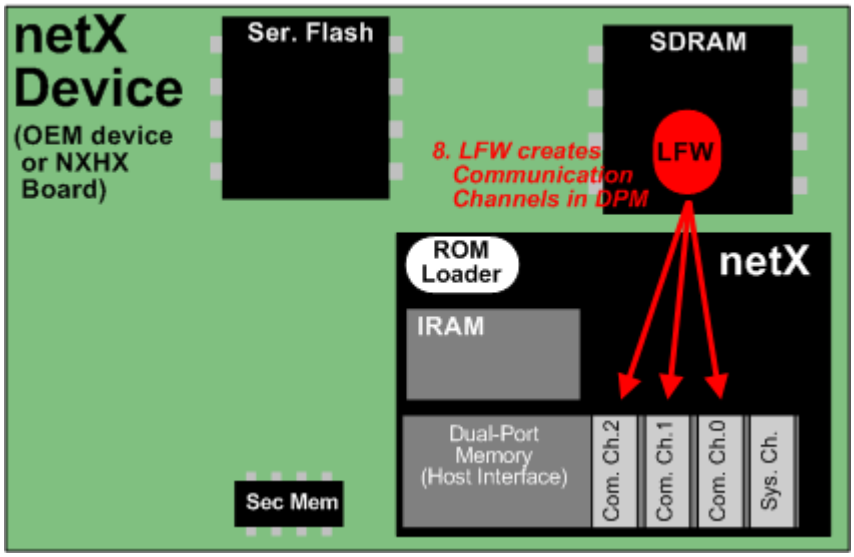

Figure 7: LFW Creates Communication Channels in DPM

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2.2 Requirements for Using Loadable Firmware

As OEM using netX controller, you need the following components in order to edit and download Hilscher Loadable Firmware:

- Hilscher Loadable Firmware file
- Hilscher Second Stage Bootloader file
- netX based OEM device/hardware
- USB or serial NULL-Modem cable
- Windows PC with
  - Hilscher netX Bootwizard application
  - Hilscher Tag List Editor
  - netHOST Device Test Application

If you are using a Hilscher NXHX Board for evaluation or development purposes, you can use the same components and tools as listed above. However, if you want to download the firmware via the PCI interface of your PC and the host interface/DPM of the NXHX Board, you need in addition:

- NXHX Board:
  - NXHX 50-xxx board (order code 7733.000 / 7733.200) or
  - NXHX 51-ETM development board (order code 7763.200) or
  - NXHX 52-JTAG development board (order code 7773.300) or
  - NXHX 500-xxx board (order code 7713.000 / 7713.200)
- Hilscher NXPCA-PCI Adapter Board (order code 7902.100)
- Hilscher CAB-NXPCA-PCI Cable (order code 4400.000)
- Windows PC with
  - Hilscher netX Bootwizard application
  - Hilscher cifX Device Driver
  - Hilscher cifX Driver Setup Utility
    (included in cifX Device Driver installation)

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3 Overview of the Necessary Steps

OEM netX device

The following table provides an overview of the steps necessary to edit and download Hilscher Loadable Firmware if you are a design-in OEM using Hilscher netX controllers on your devices.

#	Step	For details refer to
1	**Edit Second Stage Bootloader (SSBL) file on PC**	
1.1	Install Hilscher Tag List Editor on your PC.	Operating Instruction Manual *Tag List Editor*.
1.2	Use the Tag List Editor to edit device configuration parameters in tag list of SSBL file.	Chapter *Editing the Second Stage Bootloader* on page 18. and Operating Instruction Manual *Tag List Editor*.
1.3	**If no Security Memory is implemented on netX OEM device (slave device):** Use the Tag List Editor to edit device identification parameters in the HW Data tag of the SSBL tag list and enable tag.	Chapter *Editing the Second Stage Bootloader* on page 18.
2	**Download Second Stage Bootloader to flash memory of netX device**	
2.1	Install Hilscher netX Bootwizard.	Operating Instruction Manual *netX Bootwizard*.
2.2	Use the Bootwizard to download Second Stage Bootloader to netX device via USB/serial interface.	Chapter *Downloading the Second Stage Bootloader* on page 23.
3	**Edit Loadable Firmware file on PC**	
3.1	Install Hilscher Tag List Editor on your PC (if not already installed)	Operating Instruction Manual *Tag List Editor*.
3.1	Use the Tag List Editor to edit header and tag list of LFW file.	Operating Instruction Manual *Tag List Editor*.
4	**Download firmware to flash memory of netX device**	
4.1	Use the netHOST Device Test Application to download the firmware file to netX device via USB/serial interface. Note: the netHOST Device Test Application does not need to be installed on your PC.	Chapter *Downloading Firmware to the OEM netX Device* on page 33.

Table 4: Necessary Steps for Using Loadable Firmware for OEM netX Device

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NXHX Board (Hilscher netX Development Board)

The following table provides an overview of the steps necessary to download Hilscher Loadable Firmware to a Hilscher NXHX Board via the PCI interface of a PC and the host interface/DPM of the NXHX Board. If you are using a NXHX Board, you usually do not have to edit neither the Second Stage Bootloader nor the firmware file.

#	Step	For details refer to
1	**Download Second Stage Bootloader to flash memory of NXHX Board**	
1.1	Install Hilscher netX Bootwizard.	Operating Instruction Manual *netX Bootwizard*.
1.2	Use the Bootwizard to download Second Stage Bootloader to NXHX Board via USB/serial interface.	Chapter *Downloading the Second Stage Bootloader* on page 23.
2	**Install software and hardware necessary for downloading firmware from PC to NXHX Board**	
2.1	Install cifX Device Driver on your PC (installs also the cifX Driver Setup Utility).	Operating Instruction Manual *cifX Device Driver*.
2.2	Install NXPCA-PCI Adapter Board in your PC.	User Manual *NXPCA-PCI*.
2.3	Connect the NXPCA-PCI Adapter Board to the NXHX Board with the ribbon cable CAB-NXPCA-PCI.	User Manual *NXPCA-PCI*.
3	**Download firmware to flash memory of NXHX Board**	
3.1	Use the cifX Driver Setup Utility to download the firmware file to NXHX Board via PCI/host interface.	Chapter *Downloading Firmware to NXHX Board via Host Interface* on page 39.

Table 5: Necessary Steps for Using Loadable Firmware for NXHX Board

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4 Editing the Second Stage Bootloader

This section describes how to customize the delivered Second Stage Bootloader file. For this, you need the Tag List Editor tool.

This chapter is aimed at design-in OEMs using a netX processor. If you are using a NXHX Board for evaluation or development purposes, this chapter is not relevant for you, because you usually do not have to edit the Second Stage Bootloader then.

Note: Since Second Stage Bootloader version 1.3.x.x, the SDRAM and dual-port memory parameters can only be modified with the help of the Tag List Editor. It is not any longer possible to use the Hilscher netX Bootwizard application for this purpose.

For more detailed information about how to use the Tag List Editor, please refer to the Operating Instruction Manual *Tag List Editor*, which is stored on the LFW DVD in the directory `Documentation\4. Tool Manuals\3. Tag List Editor`.

For more detailed information about the Second Stage Bootloader, please refer to the Function Description *Second Stage Boot Loader*, which is stored on the LFW DVD in the directory `Documentation\4. Tool Manuals\2. 2nd Stage Bootloader`.

1. Open the Tag List Editor on your PC.

➢ In the Windows **Start** menu, choose **All Programs** > **Hilscher GmbH** > **Tag List Editor** > **Tag_List_Editor**.

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➪ The Tag List Editor opens:

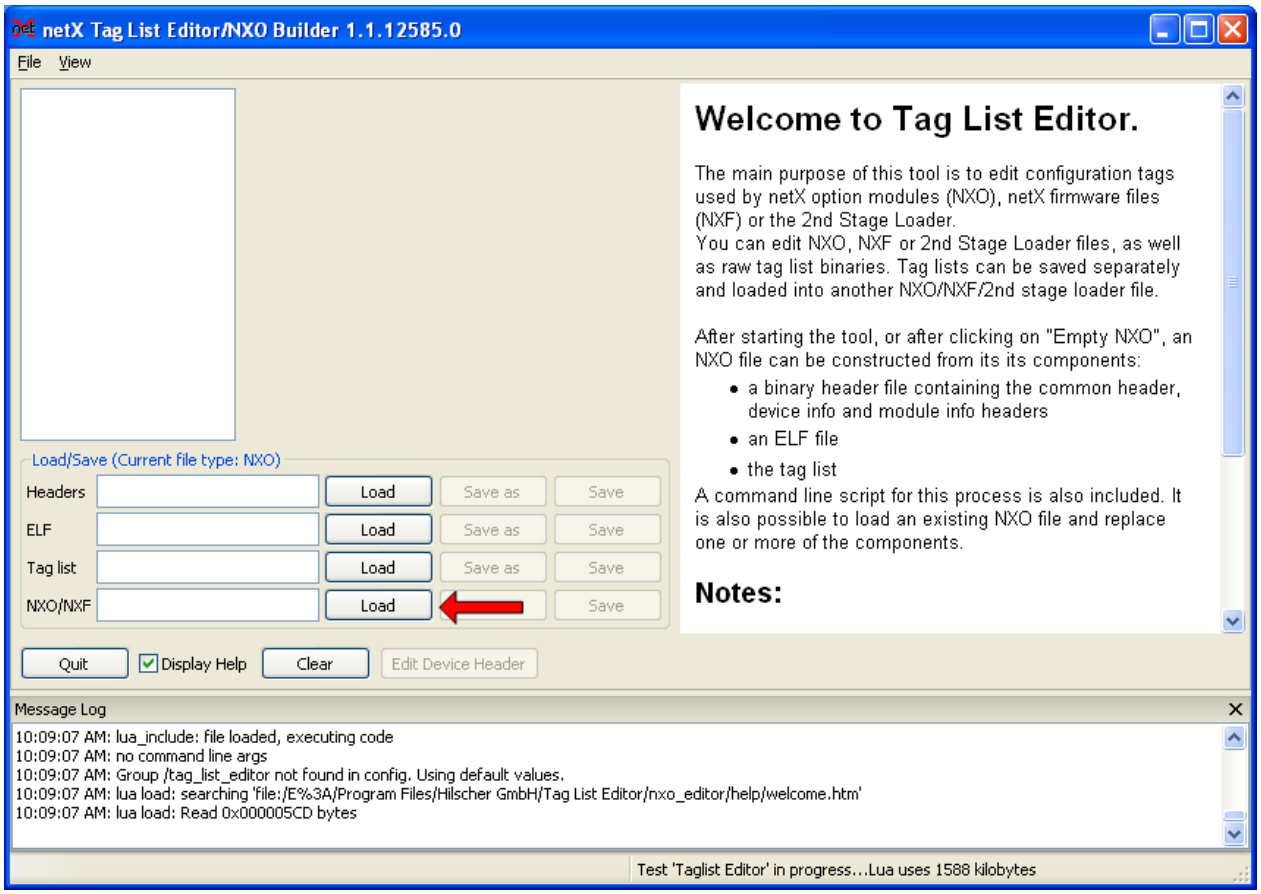
netX Tag List Editor/NXO Builder 1.1.12585.0
File View
Welcome to Tag List Editor.
The main purpose of this tool is to edit configuration tags used by netX option modules (NXO), netX firmware files (NXF) or the 2nd Stage Loader.
You can edit NXO, NXF or 2nd Stage Loader files, as well as raw tag list binaries. Tag lists can be saved separately and loaded into another NXO/NXF/2nd stage loader file.
After starting the tool, or after clicking on "Empty NXO", an NXO file can be constructed from its its components:
a binary header file containing the common header, device info and module info headers
an ELF file
the tag list
A command line script for this process is also included. It is also possible to load an existing NXO file and replace one or more of the components.
Notes:
Load/Save (Current file type: NXO)
Headers
ELF
Tag list
NXO/NXF
Load
Save as
Save
Quit
Display Help
Clear
Edit Device Header
Message Log
10:09:07 AM: lua_include: file loaded, executing code
10:09:07 AM: no command line args
10:09:07 AM: Group /tag_list_editor not found in config. Using default values.
10:09:07 AM: lua load: searching 'file:/E%3A/Program Files/Hilscher GmbH/Tag List Editor/nxo_editor/help/welcome.htm'
10:09:07 AM: lua load: Read 0x000005CD bytes
Test 'Taglist Editor' in progress...Lua uses 1588 kilobytes

Figure 8: Start Screen Tag List Editor

2. Open Second Stage Bootloader file.

➢ In the **Load/Save** area, click on **Load** button next to the **NXO/NXF** field and select the appropriate Second Stage Bootloader file. The Bootloader files are stored on the LFW DVD in the `Software\2nd Stage Bootloader` directory. For example, if you are using a netX 50 controller, choose **NETX50-BSL.bin**.

➪ The Second Stage Bootloader file is loaded in the Tag List Editor.

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3. Edit SDRAM parameters.

➢ In the tag list, click on the **SDRAM** tag to change SDRAM parameters.

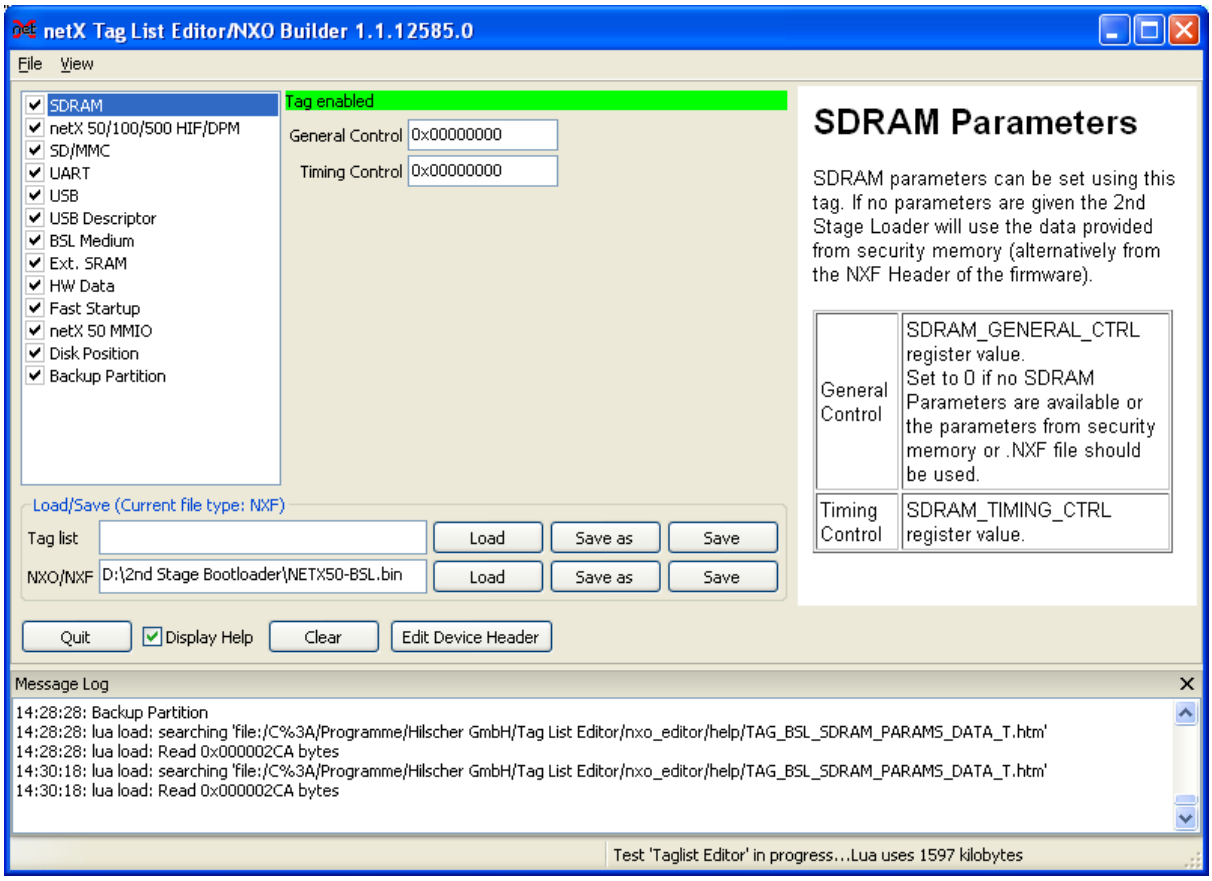
netX Tag List Editor/NXO Builder 1.1.12585.0
File View
SDRAM
netX 50/100/500 HIF/DPM
SD/MMC
UART
USB
USB Descriptor
BSL Medium
Ext. SRAM
HW Data
Fast Startup
netX 50 MMIO
Disk Position
Backup Partition
Tag enabled
General Control 0x00000000
Timing Control 0x00000000
SDRAM Parameters
SDRAM parameters can be set using this tag. If no parameters are given the 2nd Stage Loader will use the data provided from security memory (alternatively from the NXF Header of the firmware).
General Control
SDRAM_GENERAL_CTRL register value. Set to 0 if no SDRAM Parameters are available or the parameters from security memory or .NXF file should be used.
Timing Control
SDRAM_TIMING_CTRL register value.
Load/Save (Current file type: NXF)
Tag list
NXO/NXF D:\2nd Stage Bootloader\NETX50-BSL.bin
Load
Save as
Save
Quit
Display Help
Clear
Edit Device Header
Message Log
14:28:28: Backup Partition
14:28:28: lua load: searching 'file:/C%3A/Programme/Hilscher GmbH/Tag List Editor/nxo_editor/help/TAG_BSL_SDRAM_PARAMS_DATA_T.htm'
14:28:28: lua load: Read 0x000002CA bytes
14:30:18: lua load: searching 'file:/C%3A/Programme/Hilscher GmbH/Tag List Editor/nxo_editor/help/TAG_BSL_SDRAM_PARAMS_DATA_T.htm'
14:30:18: lua load: Read 0x000002CA bytes
Test 'Taglist Editor' in progress...Lua uses 1597 kilobytes

Figure 9: SDRAM Setting in Tag List Editor

Note: To create the needed SDRAM and HIF parameters, you can use the Hilscher **netX Register Creator** application, which can be downloaded from our website www.hilscher.com.

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4. Edit HIF/DPM parameters

➢ In the tag list, click on **netX 50/100/500 HIF/DPM** tag.

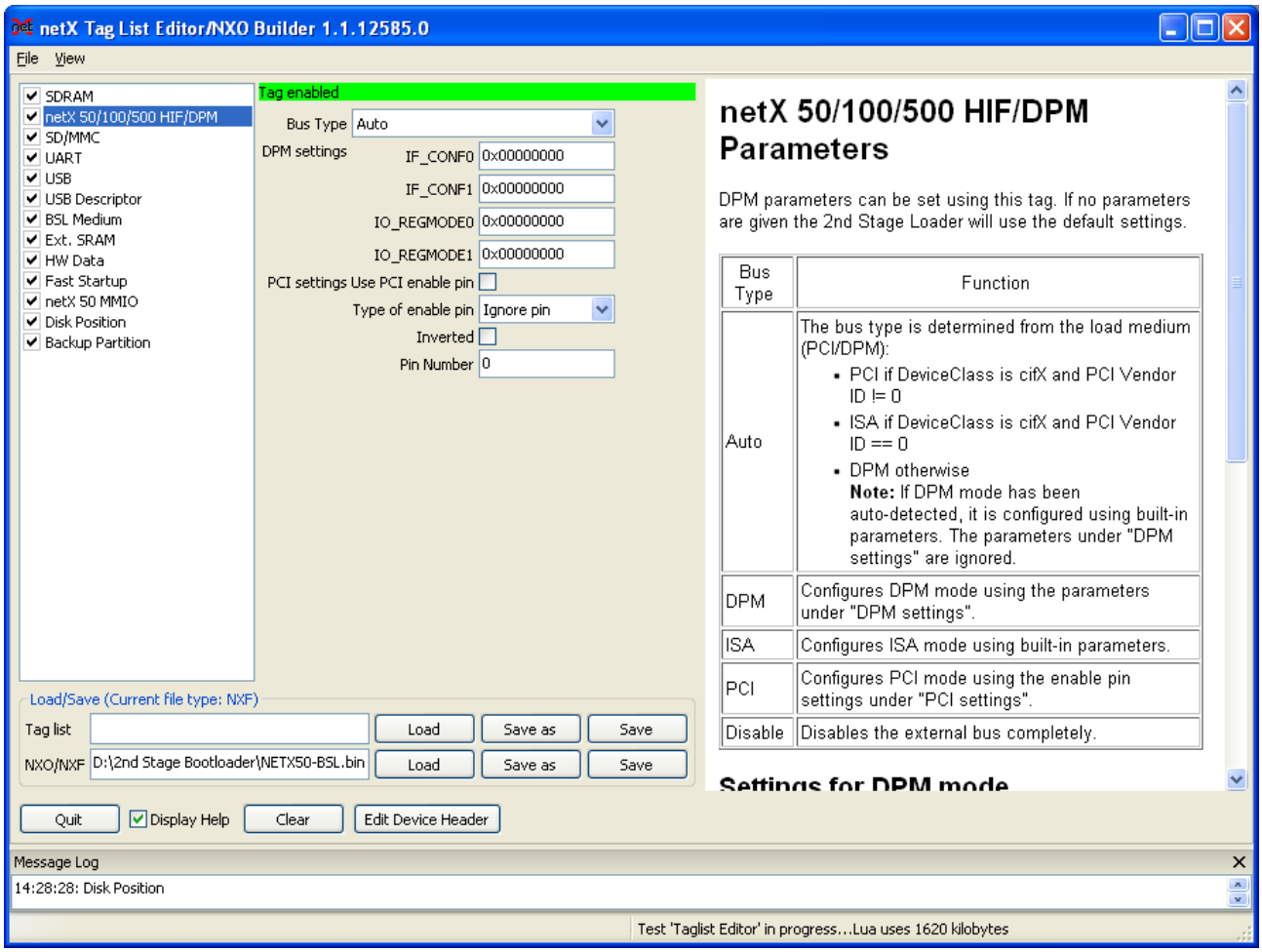

Figure 10: HIF Settings in Tag List Editor

➢ Modify the HIF parameters.

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5. If no Security Memory is implemented on your netX device (i. e. on slave devices), you also have to edit and enable the device identification parameters in the tag list of the Second Stage Bootloader file:

➢ In the tag list, click on **HW Data** tag.

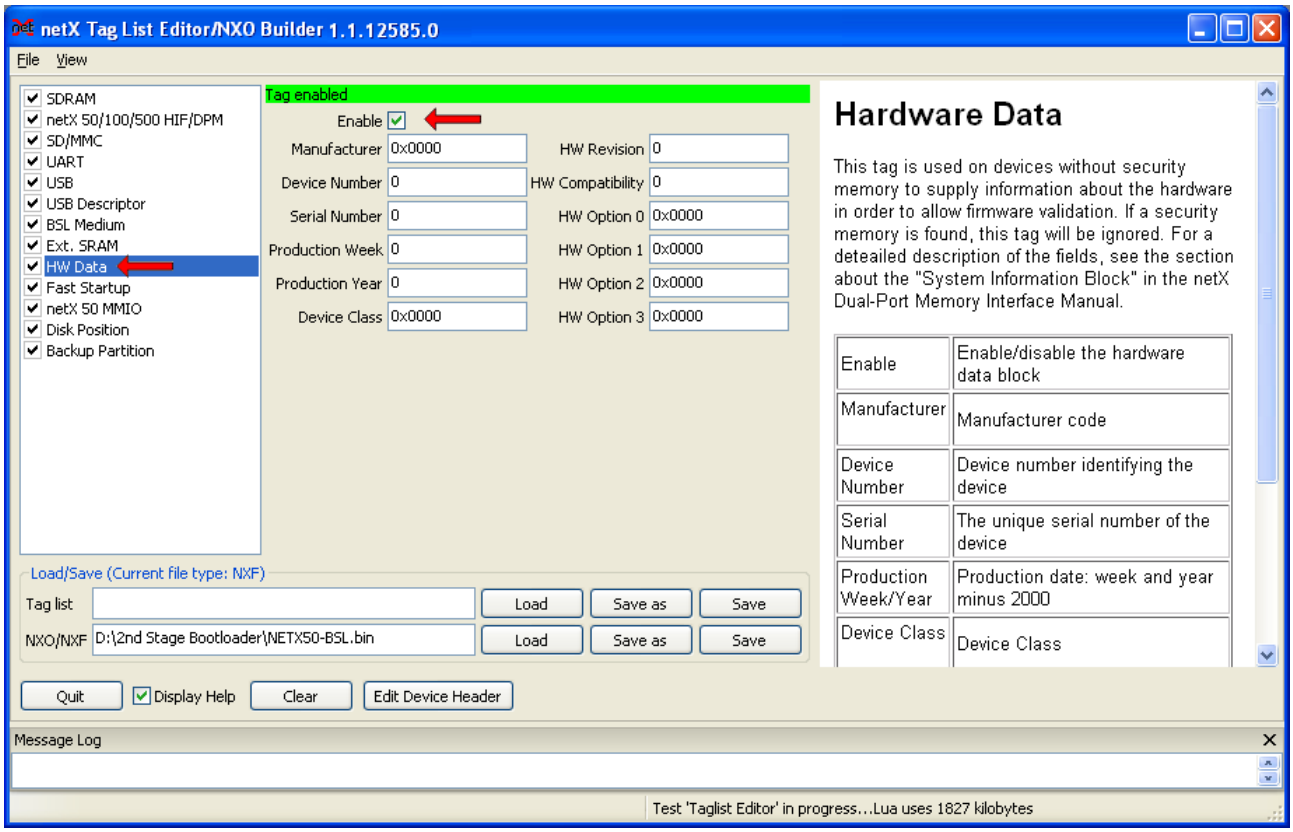

Figure 11: HIF Settings in Tag List Editor

➢ Enter the device identification parameters.

➢ Activate **Enable** check box.

6. Save Second Stage Bootloader file.

➢ In the **Load/Save** area, in the **NXO/NXF** row, click on **Save as** button to save the modified Second Stage Bootloader with a new name or click **Save** button to save the modifications into the same file.

7. Close the Tag List Editor.

➢ In the **Menu** of the Tag List Editor, choose **File** > **Quit**.

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5 Downloading the Second Stage Bootloader to the netX Device

The Second Stage Bootloader is necessary to set up a dual-port memory. It offers functionalities to get a netX based hardware basically running and enables the download of firmware files larger than 64 KB via DPM.

This section describes how to download the Second Stage Bootloader file from your PC to the Flash memory of your netX device via USB. For this, you need the Hilscher **Bootwizard** application.

This chapter is relevant for design-in OEMs using netX controllers, and for users of NXHX Boards.

For more detailed information about the Second Stage Bootloader, please refer to the Function Description *Second Stage Boot Loader*, which is stored on the LFW DVD in the directory `Documentation\4. Tool Manuals\2. 2nd Stage Bootloader`.

For more detailed information about the Bootwizard application, please refer to the Operating Instruction Manual *netX Bootwizard*, which can be found in the installation folder on your PC in the directory `Program Files\Hilscher GmbH\Bootwizard\docs`.

Note: If you are using your own customized PCB Layout on your netX based OEM device, you have to modify the dual-port memory parameters of the Second Stage Bootloader before you download it to the netX device. Otherwise your host will not be able to read the right contents of the netX DPM. For information on how to modify the Second Stage Bootloader, see chapter *Editing the Second Stage Bootloader* on page 18.

Important: Please be sure, that the flash memory of your board is empty, before you proceed with the installation of the Second Stage Bootloader. You can erase the flash memory also with the Bootwizard application. To find out how to do so, please refer to the Operating Instruction Manual *netX Bootwizard*.

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5.1 Prerequisites

- You have installed the Hilscher Bootwizard application on your PC.
- You have customized/edited the Second Stage Bootloader and have the file ready.
- The netX device is connected to the power supply and switched on.
- The LFW DVD is inserted in the DVD drive of your PC (for installing the USB driver).
- You have a USB cable ready.

5.2 Step-by-Step Instructions

1. Start the Bootwizard application on your PC.

➢ In the Windows **Start** menu, choose **All Programs** > **Hilscher GmbH** > **Bootwizard** > **Bootwizard**.

➢ The Bootwizard opens:

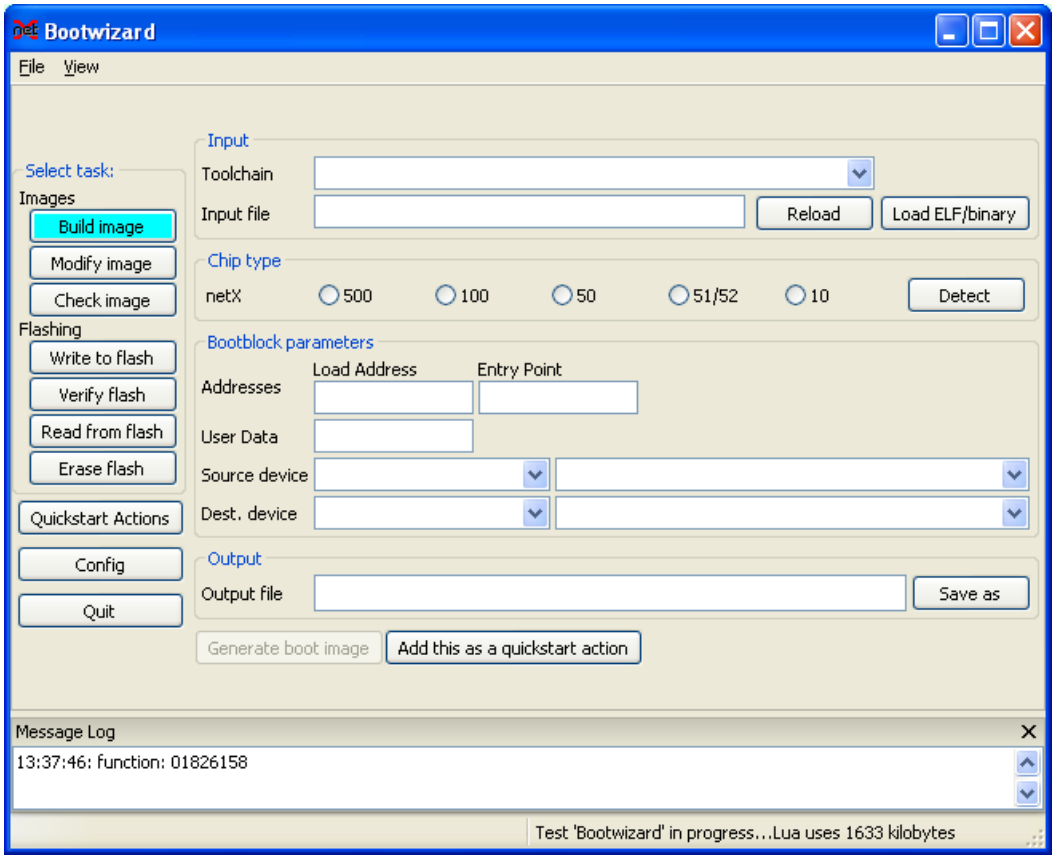

Figure 12: Bootwizard Start Screen

2. Select the task which you want the Bootwizard to perform.

➢ In the **Select Task** area, click on **Write to flash** button.

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➧ The GUI of the Bootwizard shows the fields and controls for the chosen **Write to flash** task:

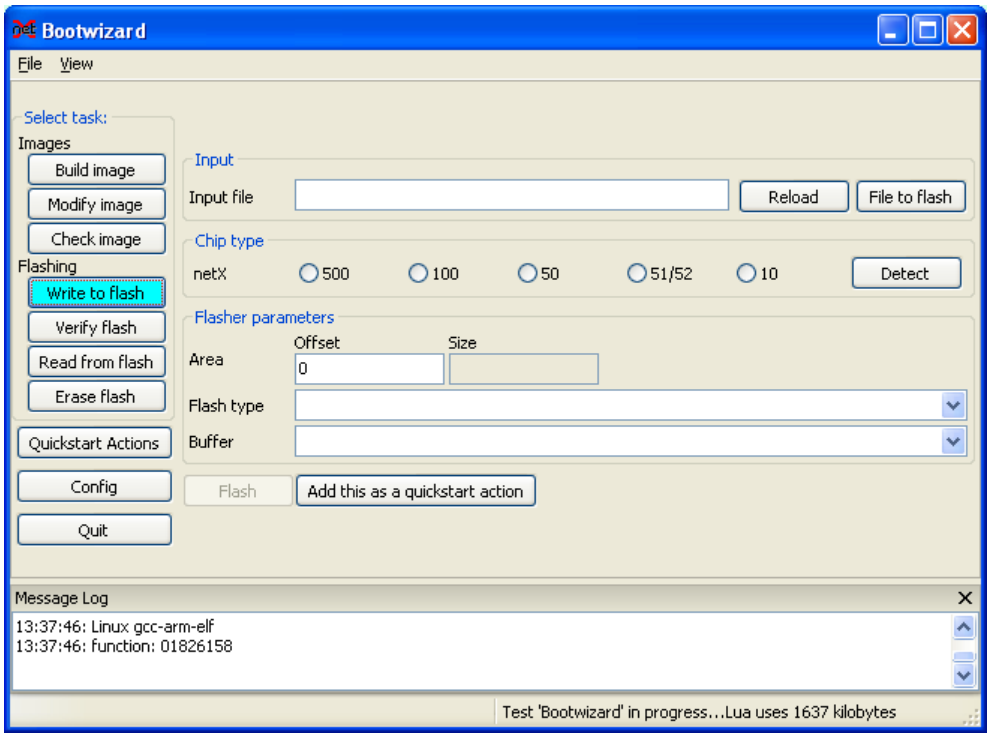

Figure 13: Bootwizard Write to Flash Screen

3. Select the Second Stage Bootloader file.

➢ In the **Input** area, click on **File to flash** button and select the prepared Second Stage Bootloader file.

➧ The Bootwizard opens the Second Stage Bootloader file. While doing so, it tries to detect the source device type from the boot header, and also the SDRAM type, if the header contains any SDRAM parameters.

4. Select or change the flasher parameters, if necessary.

➢ In the **Flasher parameters** area, select the **SDRAM type**, if necessary.

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➢ The GUI should now look similar to the following figure:

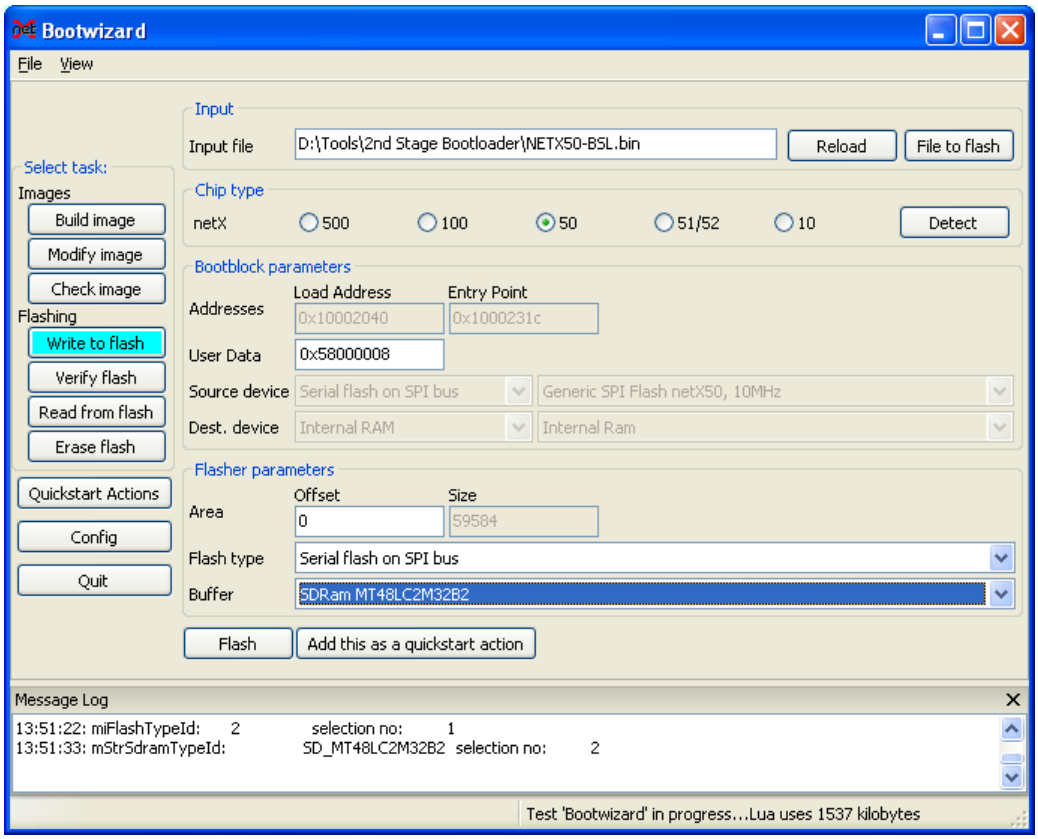

Figure 14: Selected File in Write to Flash Screen

5. Put your netX device into serial or USB boot mode. Consult your device documentation to find out how to do so. If successful, the SYS LED on the device blinks yellow, once per second.
6. Establish an USB connection.

➢ Connect the netX device to your PC via USB cable.

➢ When you connect the netX device via USB for the first time to a PC running under **Windows XP**, the **Found New Hardware Wizard** opens; if your PC is running under **Windows 7**, the **Installing device driver software** message appears in the task bar of your Windows 7 desktop.

7. Install USB Driver

Installing USB driver under **Windows XP**:

➢ In the **Found New Hardware Wizard**, answer the question **Can Windows connect to Windows Update…?**, by selecting the **No, not this time** option. Then click **Next** button.

➢ Answer the question **What do you want the wizard to do**? by selecting the **Install from a list or specific location (Advanced)** option, then click **Next** button.

➢ Select **Search for the best driver in these locations** option and choose the `Driver\USB\Windows` folder on the LFW DVD as source location, then click **Next** button.

➢ If a **Hardware Installation** warning pops up, telling you that “the software has not passed Windows Logo testing to verify its compatibility with Windows XP”, click **Continue Anyway** button.

➢ After the installation of the USB driver has been completed, click **Finish** button to close the **Found New Hardware Wizard**.

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Installing USB driver under **Windows 7**:

- If the USB driver has not yet been installed automatically, the **Device driver software was not successfully installed** warning appears in the task bar of your Windows 7 desktop.
- In the Windows 7 **Start** menu, choose **Devices and Printers**.
- The **Devices and Printers** window opens.
- In the **Devices and Printers** window under **Unspecified**, double-click the **Unknown Device** entry.

Figure 15:Unknown Device in Windows 7

- The **Unknown Device Properties** sheet opens.
- In the **Unknown Device Properties** sheet, select **Hardware** tab, then click **Properties** button.
- A second **Unknown Device Properties** sheet opens:

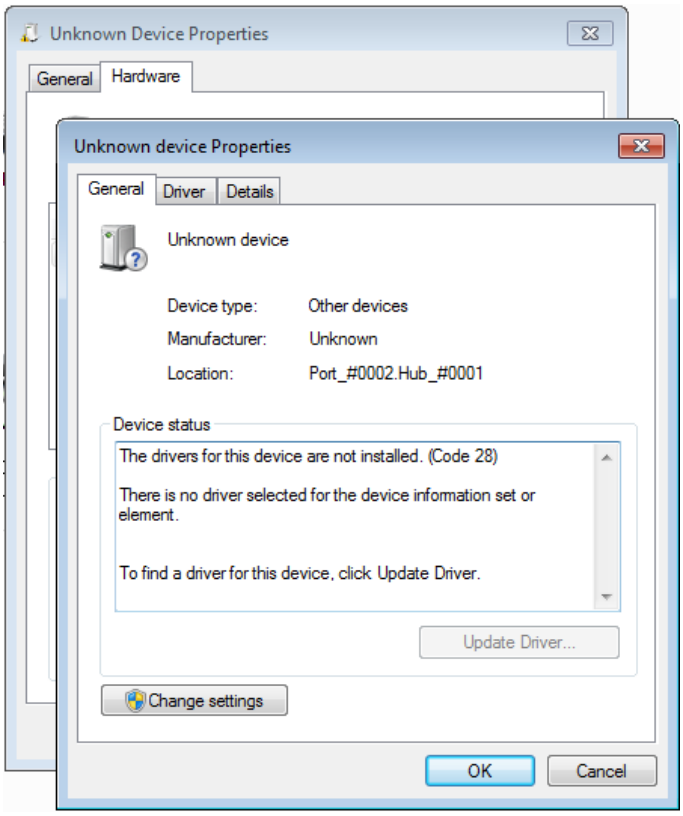

Figure 16: Unknown Device Properties in Windows 7

- In the **General** tab of the second **Unknown Device Properties** sheet, click **Change settings** button.
- Now the **Update Driver…** button in the **General** tab of the second **Unknown Device Properties** sheet is enabled.
- Click **Update Driver…** button.

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➧ The **Update Driver Software** dialog opens:

Update Driver Software - Unknown Device
How do you want to search for driver software?
Search automatically for updated driver software
Windows will search your computer and the Internet for the latest driver software for your device, unless you've disabled this feature in your device installation settings.
Browse my computer for driver software
Locate and install driver software manually.
Cancel

Figure 17: Update Driver Software Dialog in Windows 7

➢ Choose **Browse my computer for driver software** option.

➧ The **Browse for driver software** screen of the **Update Driver Software** dialog opens:

Update Driver Software - Unknown Device
Browse for driver software on your computer
Search for driver software in this location:
D:\CD-NXLFW PNS IO IRT 07'2012 V3.4\Driver\USB\Windows
Browse...
Include subfolders
Let me pick from a list of device drivers on my computer
This list will show installed driver software compatible with the device, and all driver software in the same category as the device.
Next
Cancel

Figure 18: Browse for Driver Dialog in Windows 7

➢ Click **Browse** button and choose the `Driver\USB\Windows` folder on the LFW DVD as source location, then click **Next** button.

➧ Windows installs the driver software. After the installation has been completed, the **Windows has successfully updated your driver software** message appears in the **Update Driver Software** dialog.

➢ Click **Close** button to return to the **Properties** sheet of your netX device.

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The **Properties** sheet should now look similar to this:

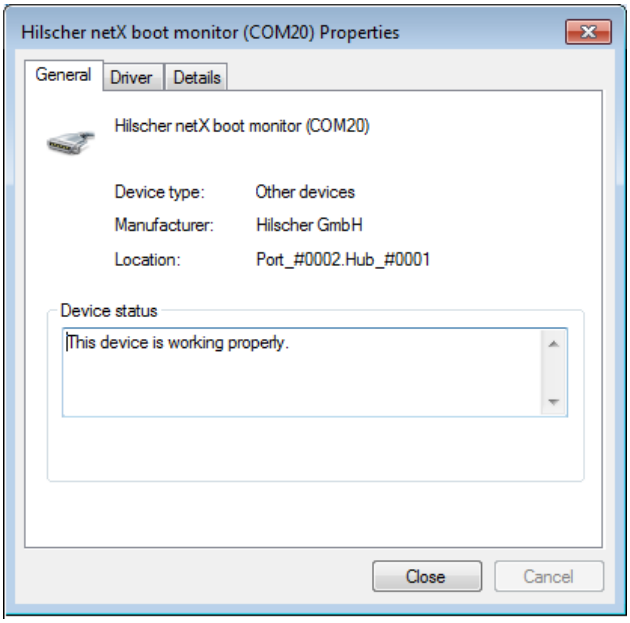

Figure 19: netX Boot Monitor USB Connection Properties in Windows 7

- Click **Close** button and return to the Windows desktop.

8. Check USB connection in Device Manager.

Checking USB connection under **Windows XP**:

- In the **Start menu,** choose **Control Panel** entry
- The **Control Panel** window opens.
- In the **Control Panel**, double-click on **System** entry.
- The **System properties** sheet opens.
- In the **System properties** sheet, select **Hardware** tab.
- In the **Hardware** tab, click **Device Manager** button.
- The **Device Manager** window opens.
- Check the entries under **Ports (COM & LPT)** for your Hilscher netX device.

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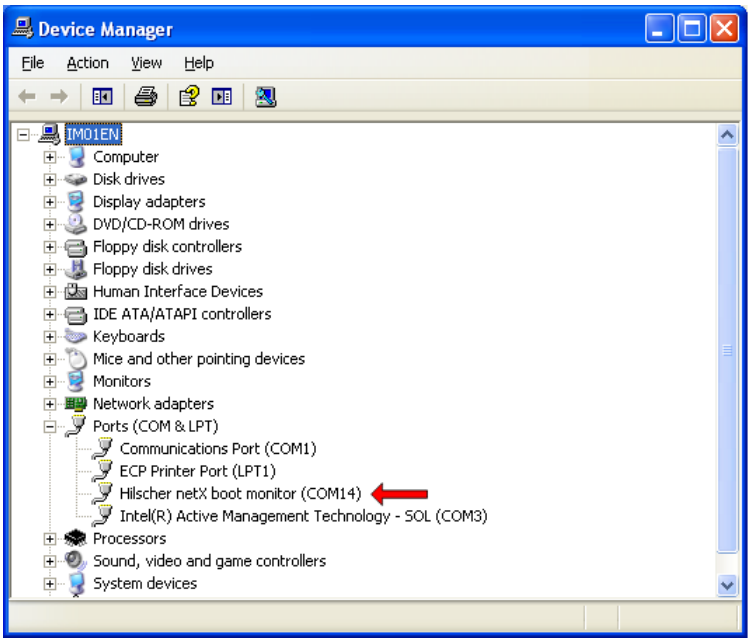

Figure 20: Check USB Connection of netX 50 Device in Windows XP

- The number of the COM port currently connected to the netX device is indicated in brackets. In this example, **COM14** is connected to the ROM Loader (**Hilscher netX boot monitor**) running on the netX device.
- Note or write down the number of the COM port, then close the **Device Manager**.

Checking USB connection under **Windows 7**:

- In the **Start** menu, choose **Control Panel** entry.
- The **Control Panel** window opens.
- In the **Control Panel** window, choose **Hardware and Sound** entry.
- The **Hardware and Sound** window opens.
- In the **Hardware and Sound** window, below **Devices and Printers**, click **Device Manager** entry.
- The **Device Manager** window opens.
- Check the entries under **Ports (COM & LPT)** for your Hilscher netX device.

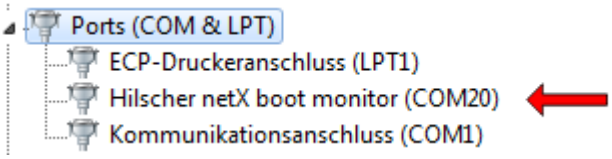

Figure 21: Check USB Connection of netX 50 Device in Windows 7

- The number of the COM port currently connected to the netX device is indicated in brackets. In this example, **COM20** is connected to the ROM Loader (**Hilscher netX boot monitor**) running on the netX device.
- Note or write down the number of the COM port, then close the **Device Manager**.

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9. Download Second Stage Bootloader file.

➢ In the Bootwizard, click on **Flash** button.

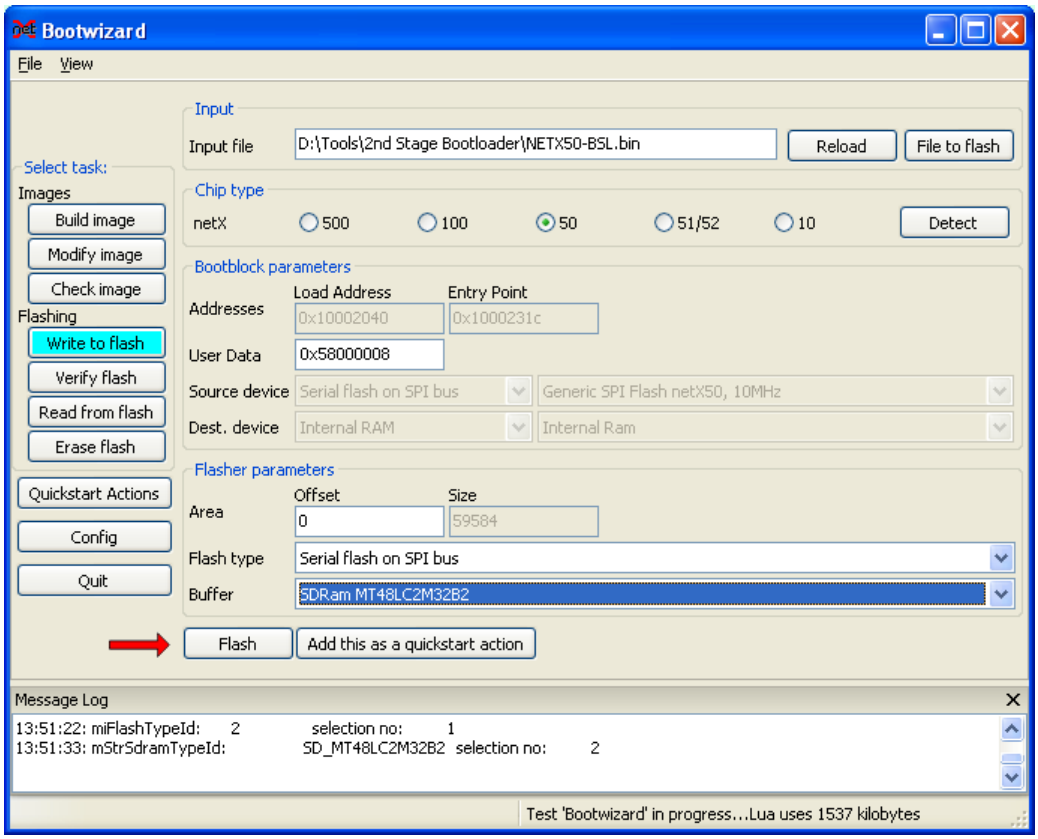

Figure 22: Write to Flash Screen

➢ The plugin selector opens.

If you are using a netX 50 controller on your netX device, the entry for your netX device in the plugin selector looks similar to this:

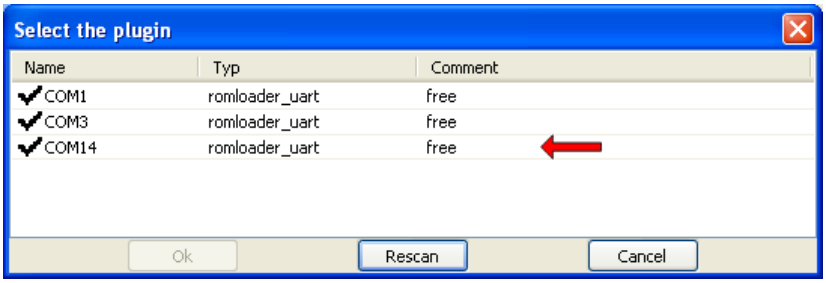

Figure 23: Plugin Selector for netX 50

If you are using a netX 100 controller on your netX device, the entry for your netX device in the plugin selector looks similar to this:

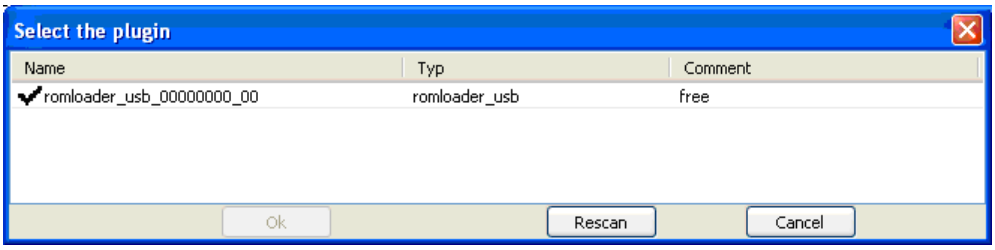

Figure 24: Plugin Selector for netX 100

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➢ Select the COM port connected to the netX device and click **OK** button (or double-click the COM port entry).

➪ The Bootwizard now sends the data file and the flasher program to the netX device and runs the flasher. During this time, a progress bar is shown:

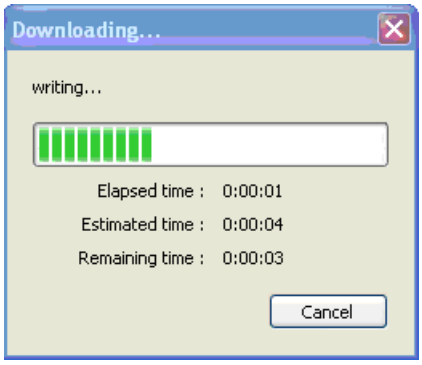

Figure 25: Progress Window

Note: After flashing, the written data is verified by reading it back and comparing it to the image in RAM. You do not have to verify explicitly.

➪ Finally, a success or error message is shown:

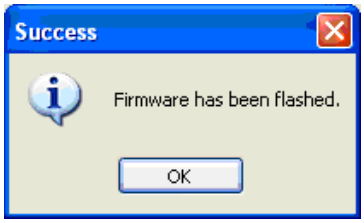

Figure 26: Flashing Successful Message

Note: If you load a boot image and then change the netX type, the source and destination devices on the GUI will be cleared. This does NOT affect the device settings in the boot header of the image, since the flasher reloads the file.

10. Disconnect the USB cable from the netX device.

11. Reset your netX device to exit boot mode and run the Second Stage Bootloader.

➪ If the Second Stage Bootloader is running on the device, the SYS-LED (RDY/RUN) is blinking cyclically yellow and green.

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6 Downloading Firmware to the OEM netX Device

This section describes how to download the firmware file from your PC to the Flash memory of your netX device via USB interface.

Unlike the Second Stage Bootloader file, the LFW file can not be downloaded by using the Bootwizard application, because the Bootwizard can not cope with the file system which is set up by the Second Stage Bootloader running on the netX device. Therefore, you need another software program to download the LFW to the flash memory of the netX device. This is the **netHOST Device Test Application**. This tool is stored on the Loadable Firmware DVD in the directory:
`Tools\netX Transport`.

Note: It is not necessary to install the **netHOST Device Test Application** on your PC, just run the program as described below.

If you are using a Hilscher NXHX Board as netX device, you can either use the USB interface to download the firmware to the Flash memory of the netX device (as described in this chapter), or you can use the method involving PCI and host interface/dual port memory as described in chapter *Downloading Firmware to NXHX Board via Host Interface* on page 39.

6.1 Prerequisites

- You have customized/edited the LFW and have the file ready.
- The netX device is connected to a power supply and switched on.
- The Second Stage Bootloader has been downloaded to the netX device and is running. The SYS-LED (RDY/RUN) is blinking cyclically yellow and green.
- You have access to the netHOST Device Test Application (which is provided on the Loadable Firmware DVD).
- You have an USB cable ready.

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6.2 Step-by-Step Instructions

1. Establish USB connection.

➢ Connect the netX device to your PC via USB cable.

➧ When you reconnect the netX device via USB to your PC running under **Windows XP**, the **Found New Hardware Wizard** opens; if your PC is running under **Windows 7**, the **Installing device driver software** message appears in the task bar of your Windows 7 desktop.

Note: The USB driver has to be installed on your PC again, because the Second Stage Bootloader, which you have downloaded in the previous chapter and is now running on the netX device, sends a new USB identification that differs from the identification which had been sent by the ROM Loader running on the netX device when you first connected it via USB in order to download the Second Stage Bootloader (see previous chapter). Therefore, it is necessary to briefly disconnect the USB cable after you have downloaded the SSBL before you proceed to download the LFW, so that Windows can recognize the new USB ID.

2. Install USB Driver

Installing USB driver under **Windows XP**:

➢ In the **Found New Hardware Wizard**, answer the question **Can Windows connect to Windows Update…?**, by selecting the **No, not this time** option. Then click **Next** button.

➢ Answer the question **What do you want the wizard to do**? by selecting the **Install the software automatically** option, then click **Next** button.

➢ If the **Hardware Installation** dialog window pops up, warning you that “the software has not passed Windows Logo testing to verify its compatibility with Windows XP”, click **Continue Anyway** button.

➢ After the installation of the USB driver has been completed, click **Finish** button to close the **Found New Hardware Wizard**.

Under **Windows 7** (and higher), the installation is performed automatically by the operating system. Wait until the **Device driver software installed successfully** message appears in the task bar of your Windows 7 desktop.

3. Check USB connection in Device Manager.

Checking USB connection under **Windows XP**:

➢ In the **Start menu,** choose **Control Panel** entry.

➧ The **Control Panel** window opens.

➢ In the **Control Panel**, double-click on **System** entry.

➧ The **System properties** sheet opens.

➢ In the **System properties** sheet, select **Hardware** tab.

➢ In the **Hardware** tab, click **Device Manager** button.

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- The **Device Manager** window opens.
- Check the entries under **Ports (COM & LPT)** for your Hilscher netX device.

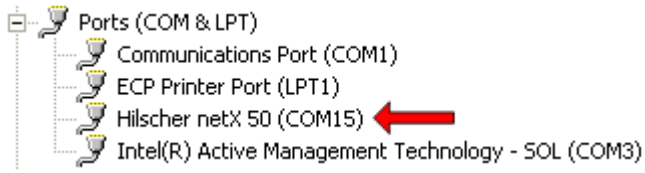
Ports (COM & LPT)
Communications Port (COM1)
ECP Printer Port (LPT1)
Hilscher netX 50 (COM15)
Intel(R) Active Management Technology - SOL (COM3)

Figure 27: Check USB Connection in Windows XP before Downloading Firmware to netX 50 Device

- The number of the COM port currently connected to the netX device is indicated in brackets. In this example, **COM15** is connected to the Second Stage Bootloader running on the **Hilscher netX 50** device.
- Note or write down the number of the COM port, then close the **Device Manager**.

Checking USB connection under **Windows 7**:

- In the **Start** menu, choose **Control Panel** entry.
- The **Control Panel** window opens.
- In the **Control Panel** window, choose **Hardware and Sound** entry.
- The **Hardware and Sound** window opens.
- In the **Hardware and Sound** window, below **Devices and Printers**, click **Device Manager** entry.
- The **Device Manager** window opens.

- Check the entries under **Ports (COM & LPT)** for your Hilscher netX device:

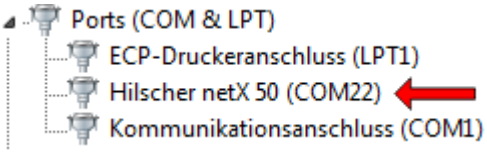

Figure 28: Check USB Connection in Windows 7 before Downloading Firmware to netX 50 Device

- The number of the COM port currently connected to the netX device is indicated in brackets. In this example, **COM22** is connected to the Second Stage Bootloader running on the **Hilscher netX 50** device.
- Note or write down the number of the COM port, then close the **Device Manager**.

4. Open the **netHOST Device Test Application** on your PC.

- Insert the Loadable Firmware DVD into your local DVD drive.
- Use the Windows Explorer to open the directory `Tools\netX Transport` on the DVD.
- Double-click **netHOST.exe**.

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➮ The **netHOST Device Test Application** opens:

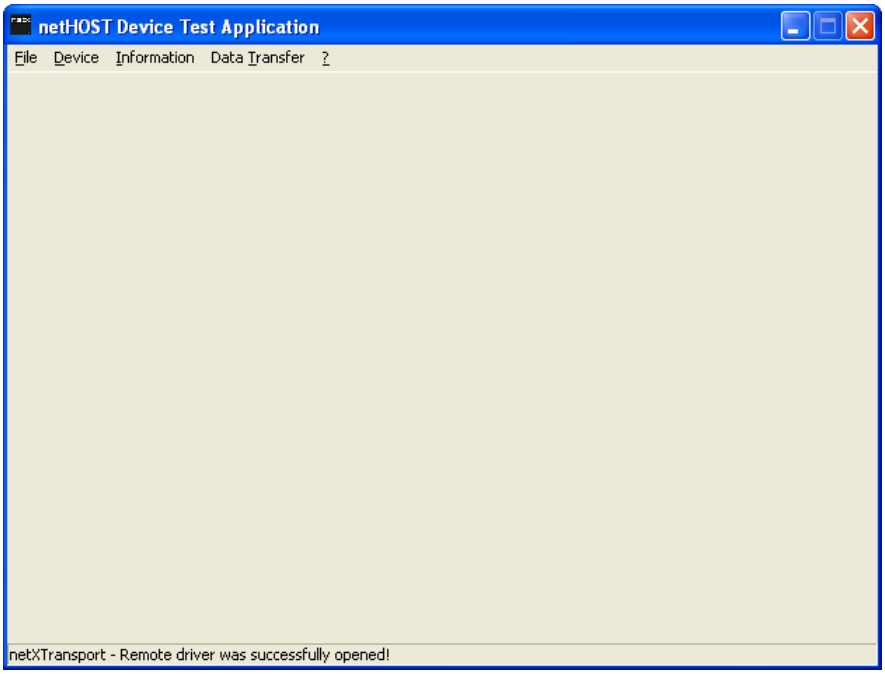
netHOST Device Test Application
File Device Information Data Transfer ?
netXTransport - Remote driver was successfully opened!

Figure 29: netHOST Device Test Application Start Screen

4. Open connection to netX device.

➢ In the menu, choose **Device** > **Open** and wait for a few seconds.

➮ After a while, the **Channel Selection** dialog box opens:

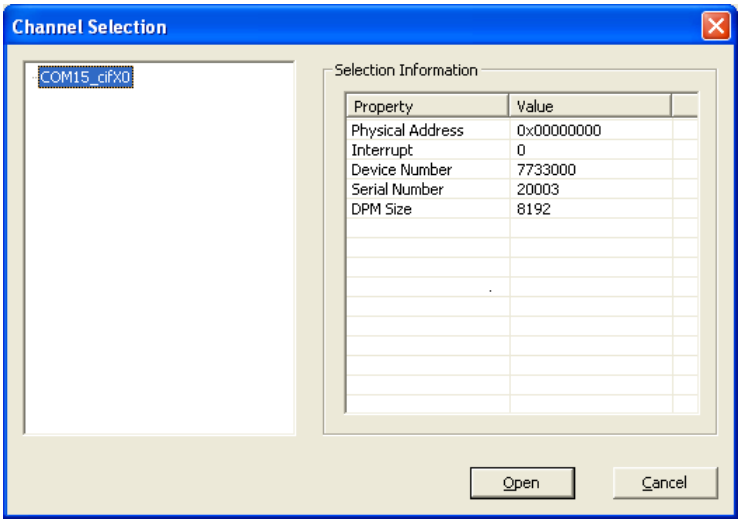

Figure 30: Channel Selection Dialog

➢ In the left part of the dialog box, select the COM port to which the netX Device is connected via USB, then click **Open** button.

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➧ The **Channel Selection** dialog box closes, and back in the **netHOST Device Test Application** window, the header displays the selected channel:

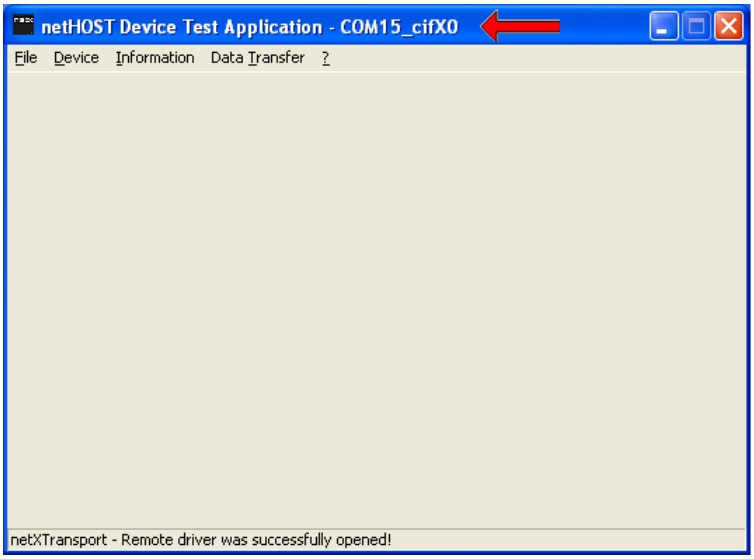
netHOST Device Test Application - COM15_cifX0
File Device Information Data Transfer ?
netXTransport - Remote driver was successfully opened!

Figure 31: netHOST Device Test Application after Channel Selection

5. Select firmware file.

➢ In the menu, choose **Device** > **Download**.

➧ The **Download** window opens:

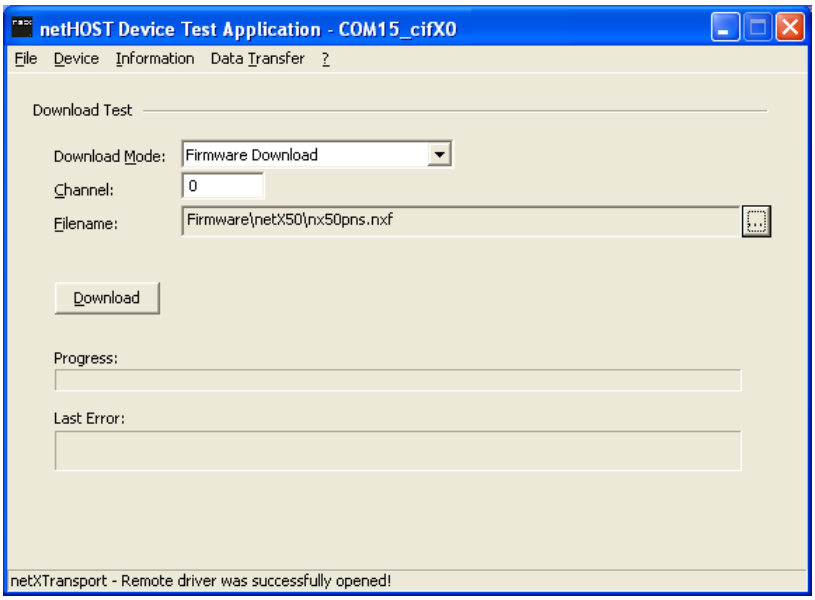

Figure 32: Download Window

➢ In the **Download Mode** drop-down list, choose **Firmware Download**.

➢ Click ... button next to the **Filename** field.

➧ The Windows file selection dialog opens.

➢ In the Windows file selection dialog, select the prepared firmware file and click **Open** button.

➧ The Windows file selection dialog closes, and back in the **Download** window, the selected Firmware file is displayed in the **Filename** field.

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6. Download firmware file.

➢ Click **Download** button to start the file download.

➧ While the firmware file is downloaded to the netX device, a progress bar is displayed:

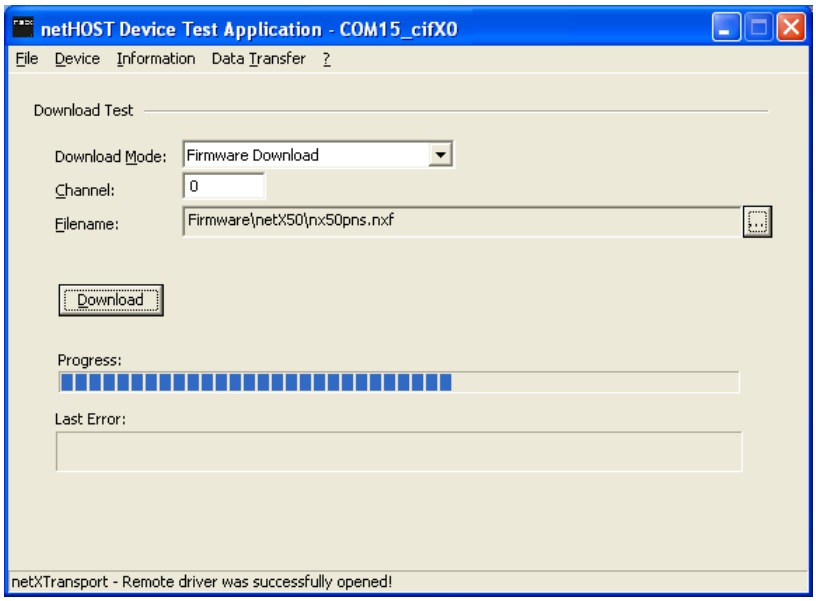

Figure 33: Firmware Download in Progress

Note: A completed download is indicated by the full progress bar; there will be no extra message box popping up in order to inform you about the completion of the download.

7. Restart netX device.

➢ After the download has been completed, reset your netX device in order to start the firmware.

➧ On the netX device, the running firmware is indicated by a green SYS-LED (RDY/RUN).

➢ In the menu of the **netHOST Device Test Application**, choose **Device** > **Close**, then choose **File** > **Quit** to exit the application.

Note: If you want to continue accessing the netX device from your PC via USB after firmware download (e. g. in order to download a configuration file), you briefly have to disconnect the USB cable from your PC, so that the firmware now running on the netX device can be recognized by Windows.

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7 Downloading Firmware to NXHX Board via Host Interface

This section describes how to download a firmware file from your PC to the Flash memory of a NXHX Board via NXPCA-PCI Adapter Board and host interface/Dual-Port Memory.

For this, you need a program called **cifX Driver Setup Utility**, which is part of the cifX Device Driver installation.

For more detailed information about the **cifX Driver Setup Utility**, please refer to the Operating Instruction Manual *cifX Device Driver*.

7.1 Prerequisites

- You have customized/edited the LFW (if necessary) and have the file ready.
- You have installed the Hilscher cifX Device Driver (includes cifX Driver Setup Utility) on your PC.
- You have installed the Hilscher NXPCA-PCI Adapter Board in your PC.
- You have connected the NXHX Board to the NXPCA-PCI Adapter Board via ribbon cable (Hilscher CAB-NXPCA-PCI Cable).
- The NXHX Board is connected to a power supply and switched on.
- The Second Stage Bootloader has been downloaded to the NXHX Board and is running. The SYS-LED (RDY/RUN) on the board is blinking cyclically yellow and green.
- Except for the cifX Driver Setup Utility, all other programs that may be accessing the NXHX Board via cifX Device Driver and Adapter Board (like e. g. SYCON.net or the cifX Test Application) must be closed.

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Enabling/disabling the NX-PCA-PCI driver before firmware download

Before you can download the firmware file, you have to acquaint the Windows driver with the new system channel in the Dual-Port Memory of the netX Device, which has been established by the Second Stage Bootloader running on the netX device.

This can be achieved by enabling/disabling the **NX-PCA-PCI driver** in the **Device Manager** of the PC:

- Open the **Device Manager** on your PC.
  In Windows XP: **Start** menu > **Control Panel** > **System** > **Hardware** > **Device Manager**
  In Windows 7: **Start** menu > **Control Panel** > **Hardware and Sound** > **Device Manager**
- In the **Device Manager**, click on the **+** Symbol in front of the **CIFx Communication Interface** entry, then right-click **NX-PCA-PCI** entry to open the context menu.
- In the context menu, select **Disable**.

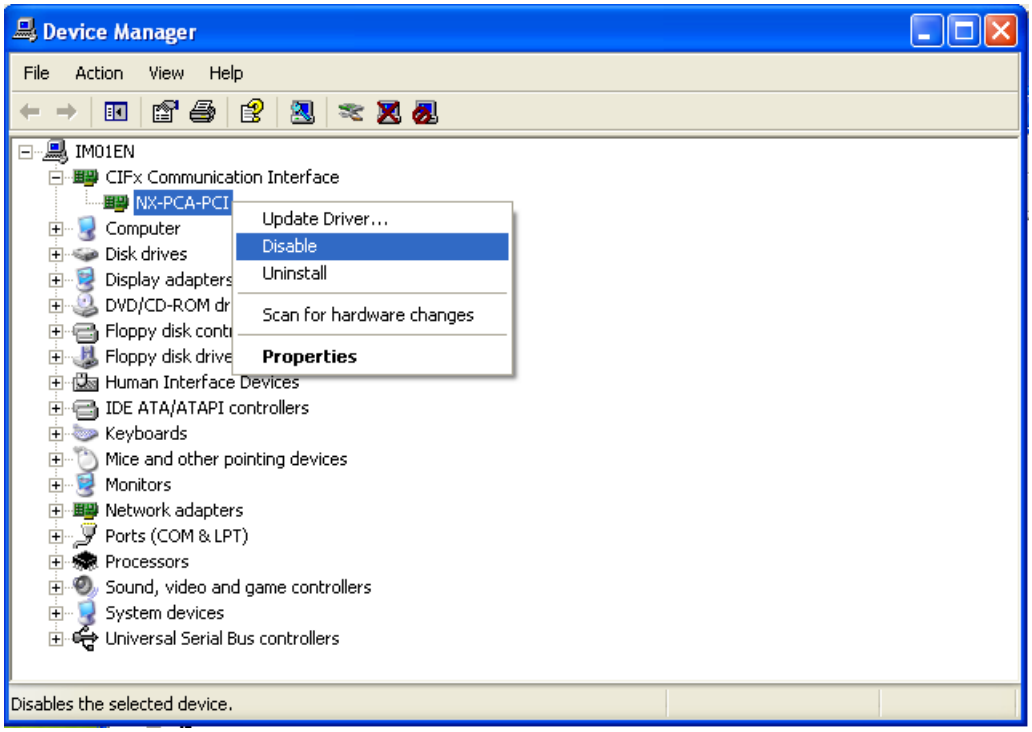

Figure 34: Disable NXPCA-PCI in Device Manager (Windows XP)

- A warning message appears.
- Acknowledge the warning message with **Yes**.

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➢ Wait for a few seconds, then open the context menu on the **NX-PCA-PCI** entry again and select **Enable**.

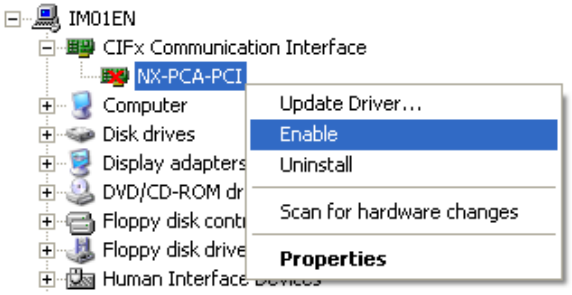

Figure 35: Enable NXPCA-PCI in Device Manager (Windows XP)

You can now proceed to download the firmware.

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7.2 Step-by-Step instructions

1. Open cifX Driver Setup Utility on your PC.

In Windows XP:

➢ In the **Start** menu, choose **Control Panel**.

➮ The **Control Panel** opens. Here you will see two cifX icons:

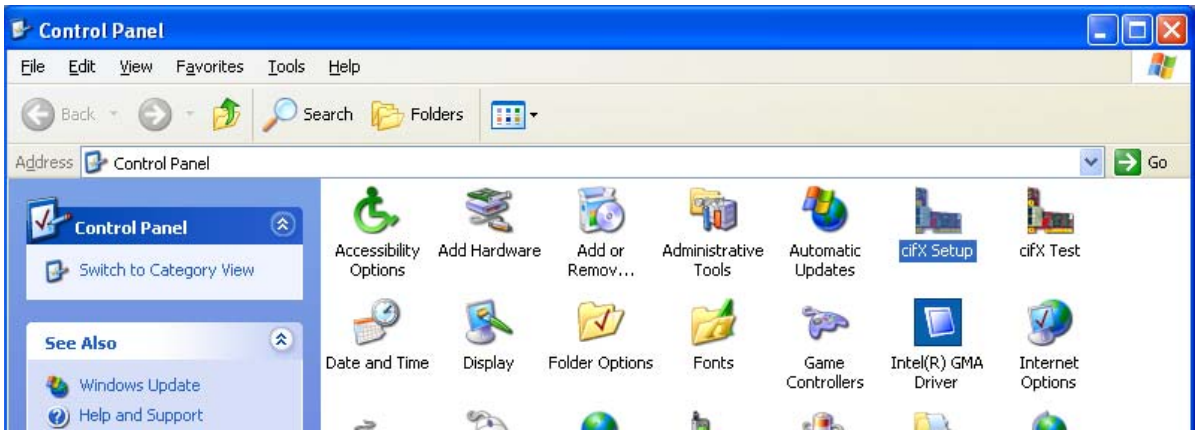

Figure 36: Control Panel in Windows XP

➢ Double-click **cifX Setup** icon.

In Windows 7:

➢ In the **Start** menu, choose **Control Panel**.

➮ The **Control Panel** opens.

➢ In the navigation bar of the **Control Panel**, click on ▸ button and select **All Control Panel Items** entry.

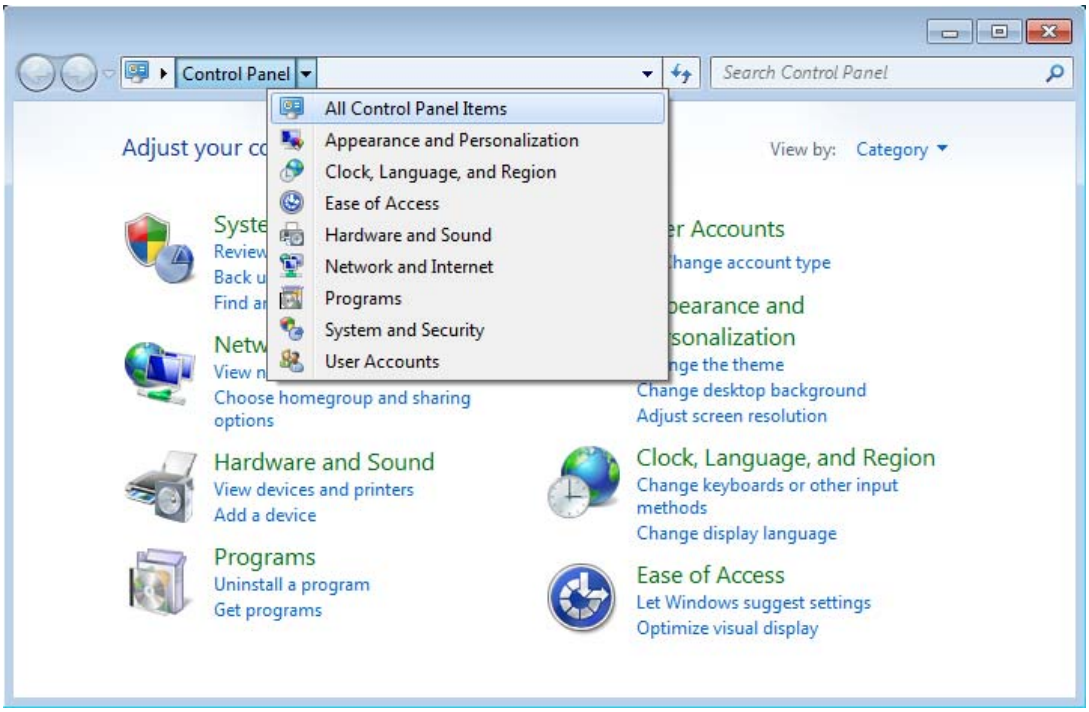

Figure 37: Control Panel in Windows 7

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➢ The **All Control Panel Items** window opens:

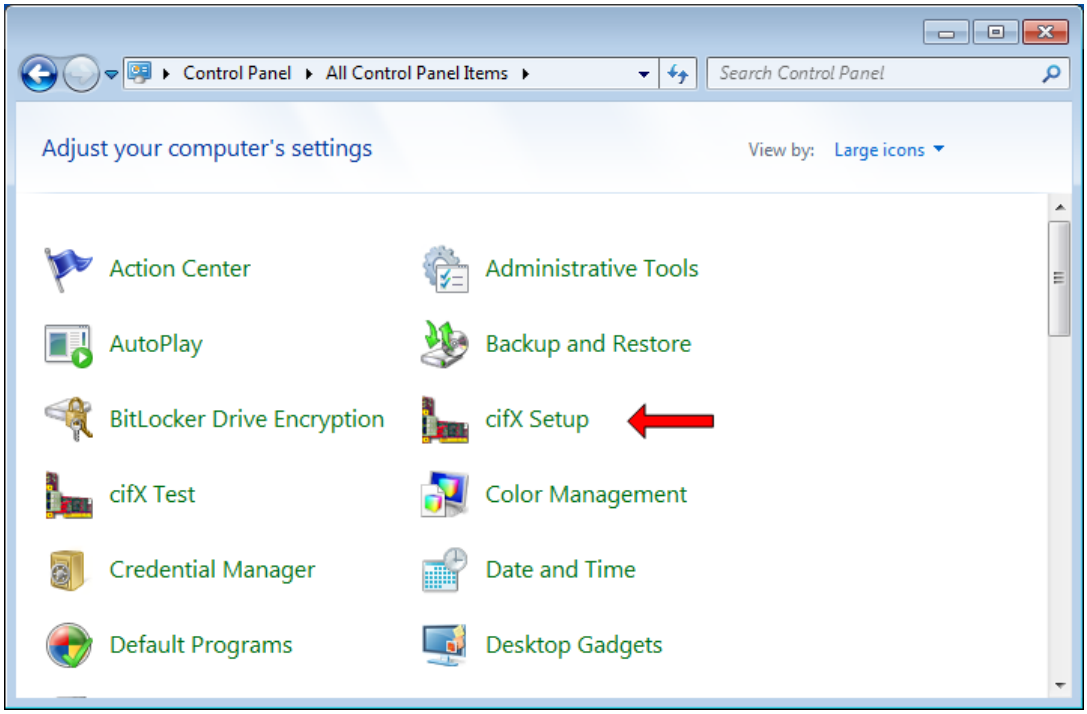

Figure 38:All Control Panel Items in Windows 7

➢ Double-click **cifX Setup** icon.

➢ Answer the question **Do you want to allow the following program to make changes to this computer** with **Yes**.

➢ The **cifX Driver Setup Utility** window opens:

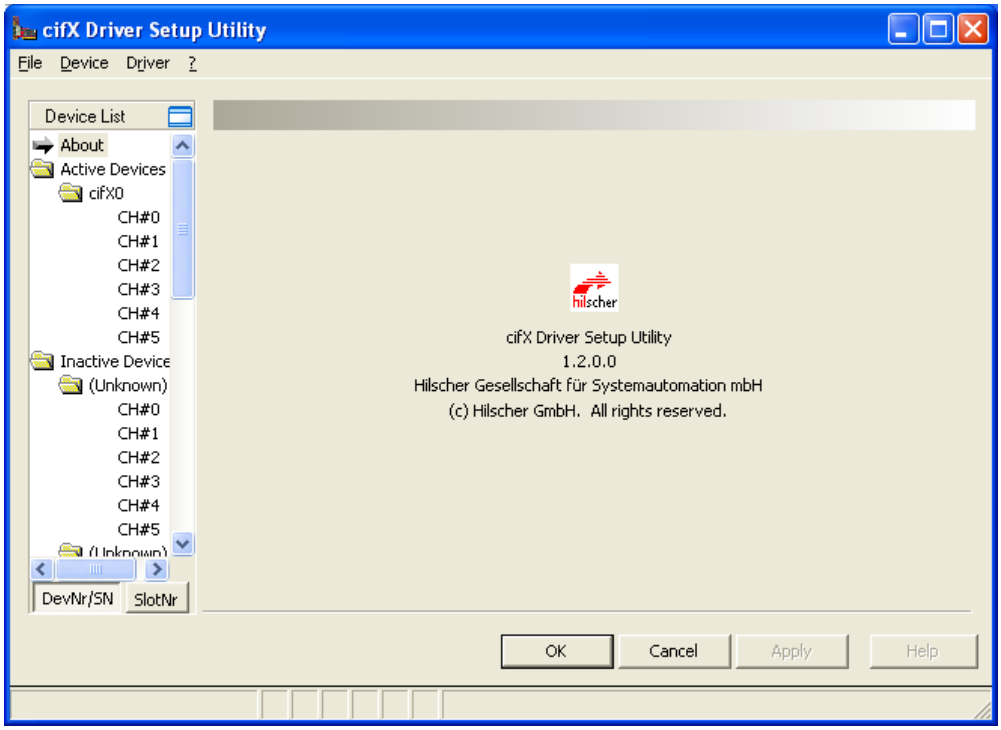

Figure 39: cifX Driver Setup Utility Start Screen

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2. Select communication channel.

➢ In the **Device List**, in the folder **Active Devices > cifX0 ()**, click **CH#0** entry.

Note: A firmware and a configuration file can be assigned to each of the communication channels CH#0 to CH#5. By default, only channel CH#0 is used for firmware files in the `.nxf` format. The other channels are used for modular firmware files in the `.nxo` format.

The following window is displayed:

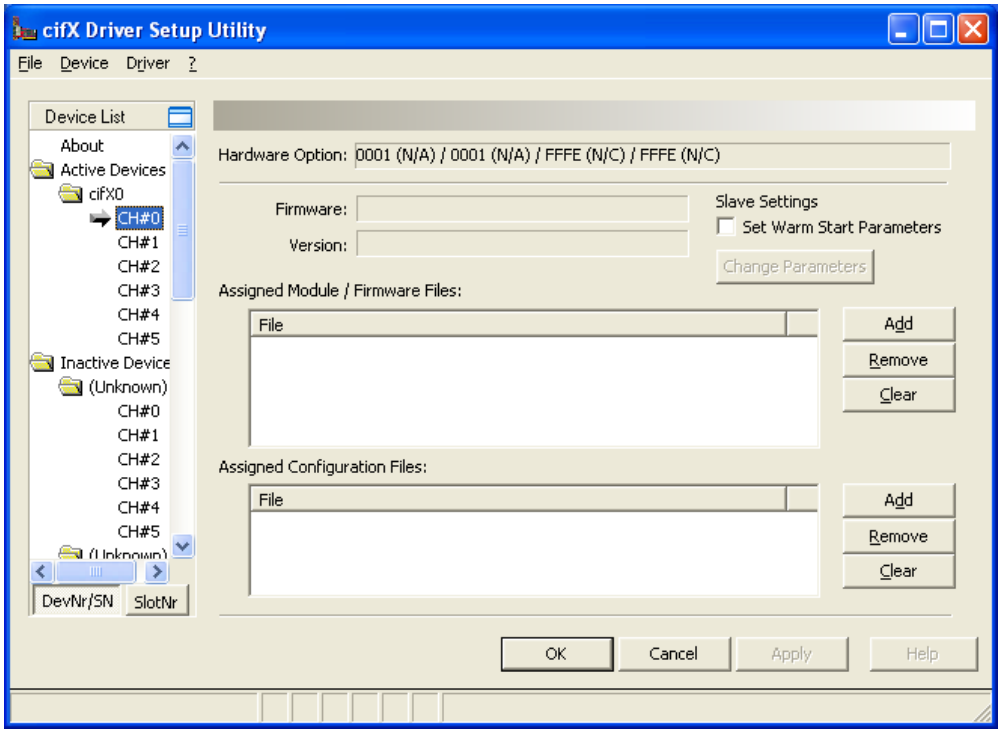

Figure 40: cifX Driver Setup Utility - Active Devices

Parameter	Meaning
Hardware Option	Shows the values for the „Hardware Assembly Options“ for the xC port 0 ... 3.
Firmware	Firmware name of the firmware file selected in the **Assigned Module / Firmware Files** window.
Version	Firmware version of the firmware file selected in the **Assigned Module / Firmware Files** window.
Slave Settings Set Warm Start Parameters	Checkbox to activate the warm start parameters.
Change Parameters	If the checkbox **Set Warm Start Parameters** is checked, the window **Change Warm Start Parameters** can be opened via the button **Change Parameters**.
Assigned Module / Firmware Files	In this field, the firmware files which are assigned for download are displayed with their corresponding file paths.
Assigned Configuration Files	In this field, the configuration files which are assigned for download are displayed with their corresponding file paths.
Add / Remove / Clear	Buttons to add, remove or to clear firmware or configuration files.

Table 6: Parameters of the Dialog Page Active Devices

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Note: If parameters have been changed by the user, this is indicated in the status bar (footer) of the **cifX Driver Setup Utility** window by the icon.

3. Select firmware file.

- In the **Assigned Module / Firmware Files** area, click **Add** button.
- A file selection dialog window opens.
- Select the firmware file and click **Open** button to exit the selection dialog.
- The selected Firmware file is displayed in the **Assigned Module / Firmware Files** field:

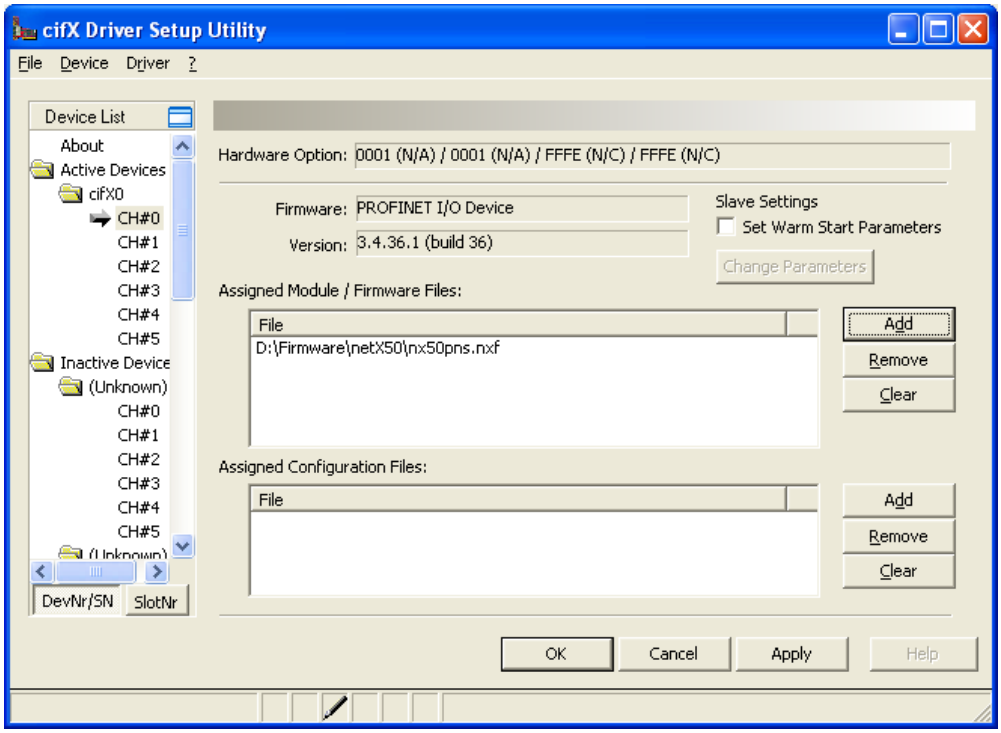

Figure 41: cifX Driver Setup Utility – Selected Firmware File

Note: If you intend to download firmware for a slave device, you can set the warm start parameters of the slave device and download them together with the firmware file. See section *Setting Warm Start Parameters* below.

4. Download firmware file.

- Click **Apply** button to activate the file download (click **OK** button to download the file and also close the **cifX Driver Setup Utility**).

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A dialog box asking you to restart the netX device appears:

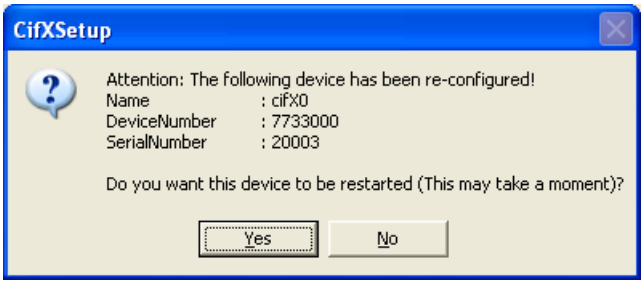
CifXSetup
Attention: The following device has been re-configured!
Name : cifX0
DeviceNumber : 7733000
SerialNumber : 20003
Do you want this device to be restarted (This may take a moment)?
Yes
No

Figure 42: Device Restart Request

➢ Answer the request with **Yes**.

The firmware file is downloaded to the netX device.

Note: The firmware file is also copied to the configuration directory on the PC, e. g. `[disk drive]:\Program Files\cifX Device Driver\1250 100_999\Channel0\`. This function is needed for netX devices without Flash memory, which are booted from the PC via PCI, like e. g. cifX PC Cards.

In case another program (e. g. SYCON.net or the netHOST Device Test Application) is accessing the netX device at the same time during download, the following warning is displayed:

Figure 43: Device Still Accessed Warning

➢ In this case, close the other program and repeat steps 3 and 4.

On the netX device, the running firmware is indicated by a green SYS-LED (RDY/RUN).

Note: If you also want to download a configuration file, click **Add** button in the **Assigned Configuration Files** area to select the configuration file (`*.nxd`), then click **Apply** button to activate the download of the configuration file.

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Setting Warm Start Parameters (for Slaves only)

The following steps are necessary for slave devices only:

1. Open **Change Warm Start Parameters** dialog window.

➢ In the **cifX Driver Setup Utility** window, activate the checkbox **Set Warm Start Parameters**.

➧ The **Change Parameters** button gets selectable.

➢ Click **Change Parameters** button to open the **Change Warm Start Parameters** dialog window.

➧ The **Change Warm Start Parameters** dialog window opens.

2. Set warm start parameters of slave.

➢ In the **Communication System** drop-down list, select the communication protocol.

Note: Be sure to choose the right communication system for your netX device.

➢ Configure the warm start parameters, then click **OK** button.

➧ Back in the **cifX Driver Setup Utility** window, the symbol is displayed in the status bar.

3. Download firmware file and warm start parameters.

➢ Click **Apply** button to activate the file download (click **OK** button to download the file and also close the **cifX Driver Setup Utility**).

➧ A dialog box asking you to restart the netX device appears:

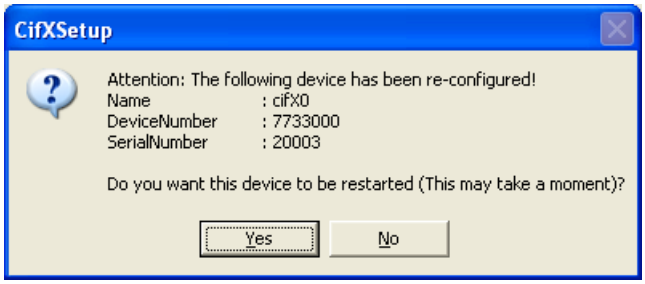
CifXSetup
Attention: The following device has been re-configured!
Name : cifX0
DeviceNumber : 7733000
SerialNumber : 20003
Do you want this device to be restarted (This may take a moment)?
Yes
No

Figure 44: Device Restart Request

➢ Answer the request with **Yes**.

➧ The firmware file and the warm start parameters are downloaded to the netX device.

➧ In case another program (e. g. SYCON.net or the netHOST Device Test Application) is accessing the netX device at the same time, the following warning is displayed:

Figure 45: Device Still Accessed Warning

➢ In this case, close the other program and repeat the download.

➧ On the netX device, the running firmware is indicated by a green SYS-LED (RDY/RUN).

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Enabling/disabling the NX-PCA-PCI driver after firmware download

If you want to continue accessing the netX device from your PC via PCI interface after firmware download (i. e. for development purposes), you again have to enable/disable the **NX-PCA-PCI driver** in the **Device Manager** of your PC. This is because the Dual-Port Memory of the netX Device has been changed by the firmware now running on the device.

For details on how to enable/disable the NX-PCA-PCI driver, see section *Enabling/disabling the NX-PCA-PCI driver before firmware download* on page 40.

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8 Example HOST Interface Configuration

The following examples show a configuration for 8 Bit non-multiplexed mode

8.1 netX 50

Register	**DPM_ARM_IO_MODE0 – DPM ARM Side Input / Output Mode 0**																															**0x1C00 3620**
Bits	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Name	PIO_MODE[63:32]																																
Value	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**0x33FF E000**
Description	0 : PIO Mode	0 : PIO Mode	1 : Host interface mode	1 : Host interface mode	0 : PIO Mode	0 : PIO Mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	

Table 7: netX50 DPM_ARM_MODE0 Register

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Register **DPM_ARM_IO_MODE1 – DPM ARM Side Input / Output Mode 1** **0x1C00 3630**

Bits	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Name	IN_CONTROL		reserved										PIO_MODE[85:64]																				
Value	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	1	1	1	1	0	0	1	1	0	0	1	1	1	0x000E 7E67
Description	00 : Input data latched by nPOR		reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved	0 : PIO Mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	0 : PIO Mode	0 : PIO Mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface Mode	0 : PIO Mode	0 : PIO Mode	1 : Host interface mode	1 : Host interface mode	0 : PIO Mode	0 : PIO Mode	1 : Host interface Mode	1 : Host interface Mode	1 : Host interface Mode		

Table 8: netX50 DPM_ARM_MODE1 Register

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Register **DPM_ARM_IF_CFG0 – DPM ARM Side Host Interface Configuration Register 0** **0x1C00 3608**

Bits	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Name	DISABLE_WR	HIF_MODE			RD_CTRL		WR_CTRL		BE1_MODE			BE0_MODE			CIS_MODE		WAIT_DRV		WAIT_MODE	WAIT_POLARITY	CS_MODE			IRQ_MODE		IRQ_POLARITY	ALE_MODE		ADDR_MODE	OE_MODE			
Value	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	1	0	0	1	0	0	0	1	0	0	1	0	**0x2024 4912**
Description	This bit is set any consecutive write accesses to the register are blocked	010 : µP Bus 8 bit (Dual-Port memory)			00 : RDn; PIO[52] A read cycle is selected when the RDn line has a low level (in 32 Bit mode also the Byte Enable Signals BE[3:0] must be low)		00 : WRLn; PIO[45] A write cycle is selected when the WRLn (WRn) line has a low level		001 : A0; PIO[73] The high byte is selected when the A0 line has a high level (e.g. 8 bit Dual-Port memory interface)			001 : A0; PIO[73] The low byte is selected when the A0 line has a low level (e.g. 8 bit Dual-Port memory interface)			00 : Never		01 : push / pull output		0 : WAIT / BUSY mode function. An active signal indicates that the current access can not yet be finished by the host CPU	0 : low active polarity output	100 : CS0n, PIO[51] The netX DPM is selected when the CS0n line has a low level			10 : push pull output		0 : active low polarity output	01 : address latching on high signal level of PIO[35]		0 : non multiplexed 8/16 bit address mode	010 : RDn; PIO[52] Output drivers are enabled by a low RDn signal.			

Table 9: netX50 DPM_ARM_IF_CFG0 Register

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Register **DPM_ARM_IF_CFG1 – DPM ARM Side Host Interface Configuration Register 0** **0x0010 360c**

Bits	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Name	WRITE_PROTECT	IRQ_POL_PIO72	IRQ_POL_PIO47	IRQ_POL_PIO40	IRQ_POL_PIO36	IRQ_POL_PIO35	DATAOUT_VALID_TIME		DIS_BUSY_TIMEOUT	reserved			ADR_IN[15:12]				CS_COMP_SRC[19:12]								CS_COMP_VAL[19:12]								
Value	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0x0100 0000**
Description	This bit is set any following write accesses to the register are impossible	External interrupt polarity for PIO[72]	External interrupt polarity for PIO[47]	External interrupt polarity for PIO[40]	External interrupt polarity for PIO[36]	External interrupt polarity for PIO[35]	01 : 1 system clock		This flag is not set, any access to the netX host interface will be aborted after 256 system clocks	reserved			Logic level for Dual-Port memory address lines [15:12] when used as input / output pin (pio mode) or when the chip select comparator is enabled				0 : internal (compare with CS_COM_VAL)								Chip Select compare value when internal compare source is used								

Table 10: netX50 DPM_ARM_IF_CFG1 Register

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8.2 netX 100/500

Register	DPM_ARM_IO_MODE0 – DPM ARM Side Input / Output Mode 0																														0x0010 3620
Bits	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Name	PIO_MODE[63:32]																																
Value	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0x33FF E000
Description	0 : PIO Mode	0 : PIO Mode	1 : Host interface mode	1 : Host interface mode	0 : PIO Mode	0 : PIO Mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	0 : PIO Mode	

Table 11: netX100/500 DPM_ARM_IO_MODE0 Register

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Register **DPM_ARM_IO_MODE1 – DPM ARM Side Input / Output Mode 1** **0x0010 3630**

Bits	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Name	IN_CONTROL		reserved										PIO_MODE[84:64]																				
Value	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	1	1	1	1	0	0	1	1	0	0	1	1	1	0x000E 7E67
Description	00 : Input data latched by nPOR		reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	0 : PIO Mode	0 : PIO Mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface mode	1 : Host interface Mode	0 : PIO Mode	0 : PIO Mode	1 : Host interface mode	1 : Host interface mode	0 : PIO Mode	0 : PIO Mode	1 : Host interface Mode	1 : Host interface Mode	1 : Host interface Mode		

Table 12: netX100/500 DPM_ARM_IO_MODE1 Register

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Register **DPM_ARM_IF_CFG0 – DPM ARM Side Host Interface Configuration Register 0** **0x0010 3608**

Bits	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Name	DISABLE_WR	HIF_MODE			RD_CTRL		WR_CTRL		BE1_MODE			BE0_MODE			CIS_MODE		WAIT_DRV		WAIT_MODE	WAIT_POLARITY	CS_MODE			IRQ_MODE		IRQ_POLARITY	ALE_MODE		ADDR_MODE	OE_MODE			
Value	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	1	0	0	1	0	0	0	1	0	0	1	0	**0x2024 4912**
Description	This bit is set any consecutive write accesses to the register are blocked	010 : µP Bus 8 bit (Dual-Port memory)			00 : RDn; PIO[52] A read cycle is selected when the RDn line has a low level		00 : WRLn; PIO[45] A write cycle is selected when the WRLn (WRn) line has a low level		001 : A0; PIO[73] The high byte is selected when the A0 line has a high level (e.g. 8 bit Dual-Port memory interface)			001 : A0; PIO[73] The low byte is selected when the A0 line has a low level (e.g. 8 bit Dual-Port memory interface)			00 : Never		01 : push / pull output		0 : WAIT / BUSY mode function. An active signal indicates that the current access can not yet be finished by the host CPU	0 : low active polarity output	100 : CS0n, PIO[51] The netX DPM is selected when the CS0n line has a low level			10 : push pull output		0 : active low polarity output	01 : address latching on high signal level of PIO[35]		0 : non multiplexed 8/16 bit address mode	010 : RDn; PIO[52] Output drivers are enabled by a low RDn signal.			

Table 13: netX100/500 DPM_ARM_IF_CFG0 Register

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Register **DPM_ARM_IF_CFG1 – DPM ARM Side Host Interface Configuration Register 0** **0x0010 360c**

Bits	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Name	WRITE_PROTECT	IRQ_POL_PIO72	IRQ_POL_PIO47	IRQ_POL_PIO40	IRQ_POL_PIO36	IRQ_POL_PIO35	DATAOUT_VALID_TIME		DIS_BUSY_TIMEOUT	reserved			ADR_IN[15:12]				CS_COMP_SRC[19:12]								CS_COMP_VAL[19:12]								
Value	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0x0100 0000**
Description	This bit is set any following write accesses to the register are impossible	External interrupt polarity for PIO[72]	External interrupt polarity for PIO[47]	External interrupt polarity for PIO[40]	External interrupt polarity for PIO[36]	External interrupt polarity for PIO[35]	01 : 1 system clock		This flag is not set, any access to the netX host interface will be aborted after 256 system clocks	reserved			Logic level for Dual-Port memory address lines [15:12] when used as input / output pin (pio mode) or when the chip select comparator is enabled				0 : internal (compare with CS_COM_VAL)								Chip Select compare value when internal compare source is used								

Table 14: netX100/500 DPM_ARM_IF_CFG1 Register

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